Division of Mathematics, Science and Engineering

Program Review

2007-2010

Submitted August 2011

Comprehensive Program Review Report

Program: Overview of Mathematics, Science and Engineering Division
Academic Year Reviewed: 2010-2011
Due: October 31, 2010

Programs

Astronomy		Geography
Biological Sciences		Geology
Chemistry		Mathematics
Drafting /Computer Aided Design		Physical Science
Earth Science		Physics
Engineering		Water Treatment

Area 1 Mission

1.1 State the mission of the program.

The mission of the Division of Mathematics, Science and Engineering is to provide our students--through basic skills, non-transferable, and transferable collegiate curricula-- the skills and knowledge that will enable them to be life-long learners able to function qualitatively and quantitatively in the physical and biological world in which they live.

As part of a dynamic college with a very diverse curriculum, we strive to prepare our students to be adaptable to future personal activities and transformations in local, regional, national and global marketplaces.

We strive to achieve our course and programmatic learning objectives through a continuous reassessment of College objectives and those of our students.

Subject areas within the division support the mission described above.

1.2 Comment on the areas of the mission, vision, and Institutional Learning Outcomes (ILOs) of the college that are most closely related to the mission of the program.

The broad scope of the division ensures that each ILO is incorporated to varying degrees. Students learn how they interact with the physical world and how it influences them. They develop lifelong learning skills necessary to succeed in today's complex world through exposure to multidisciplinary studies, and learn to solve problems though critical thinking, informational literacy and a variety of technologies. Through teamwork, hands-on activities, and application of knowledge, students become better prepared for integration into the workforce and a wide range of career opportunities.

Student Learning Outcomes

Faculty worked together to establish Student Learning Outcomes (SLOs) and implement assessment tools for 90 of 93 courses in the division. SLOs are clearly linked to Institutional Learning Outcomes (ILOs). Each course has a faculty member designated by consensus to collect, aggregate, and report data. Aggregate data are accessible to all faculty members for review via WEAVE software. As sufficient data are collected, faculty members within each subject area meet to formulate and follow through with action plans. Faculty members are also using this data to aid in drafting Program Learning Outcomes (PLOs).

During the next three to five year time frame divisional programs: Biological Sciences, Drafting/Computer-Aided Design, Engineering Technology, Mathematics, Physical Science, Geographic Information Systems and Water Treatment will have fully developed PLOs and all courses will have fully developed SLOs. Each course SLO will be assessed at least once per academic cycle with results reported utilizing WEAVE. PLO's will be assessed once per academic cycle, with results also reported using WEAVE.

Assessment results will be evaluated for each course and program and reported in WEAVE once per cycle. Once assessment data are entered into WEAVE, it will be readily accessible for use in ongoing program and course review, budget and planning, analysis, assessment, and dialogue for continuous quality improvement. Assessment results will be used to generate action plans, with budgeted items summarized in WEAVE. Summaries will be reported directly to the dean for evaluation and inclusion in the SPBC budget process. SLO and PLO assessments will serve as the starting point for generation of annual learning related budgetary items.

Budgetary Impact

As a function of the state of California's large budget deficit, there have been compensatory cuts to higher education including the community college system. As such, the College and Division of Mathematics, Science and Engineering have had to respond to decreases in the state's apportionment, including funds for growth in the student population, to AVC. These responses are reflected in three areas of funding including course offerings, faculty positions, and materials and supplies.

Table 1. Sections Taught or Scheduled in Math, Science and Engineering.
From Intersession 2009 to Fall Semester 2010.

Discipline	Int09	Sp 09	Su 09	Fall 09	Int 10	Sp 10	Su 10 **	F10 **
Astronomy	2	13	4	8	0	8	2	6
Biological Sciences	14	88	27	91	2	78	14	89
Chemistry	5	61	20	58	3	44	10	59

Drafting	0	4	0	3	0	3	0	3
Earth Science	0	2	0	2	0	2	0	2
Engineering	0	9	1	8	0	9	1	8
Geography	2	16	5	19	0	16	2	18
Geology	0	9	0	7	0	7	0	7
Mathematics	42	144	68	146	10	126	24	145
Physics	0	5	2	5	0	6	1	7
Physical Science	2	5	2	4	0	3	1	4
Water Treatment*	0	3	0	2	0	0	0	2***
Totals	**67**	**359**	**129**	**353**	**15**	**302**	**55**	**350**
* Non-credit.								
** Scheduled sections.								
*** Rev. Appr. Credit.								

Although AVC in general was experiencing a period of continuous growth in the student population, this growth has been over cap and unfunded. In order to maintain base funding, the college through the activities of the Enrollment Management Committee, the Budget Sub-committee of SPBC, and Institutional Research and Planning decided not to exceed cap and hence reduce the number of course sections to be offered during the 2010-2011 academic year. The numbers of sections taught from intersession (Int) 2009 to fall semester (F) 2010 are presented in Table 1. Comparison of each term reveals reductions in offerings of 67 percent in sections taught during intersession, 16 percent for spring (Sp), 57 percent proposed for summer session (Su) and 0.5 percent for F . It is worthy of note that although sections were cut, the divisional programs were not impacted and all but three courses were represented in the schedules.

As another cost savings, the College also froze all open administrative and full-time faculty positions. The Division was not impacted administratively. At present, however, six full-time instructional faculty positions remain unfilled. These include: four positions in mathematics, one position in engineering/computer-aided design and a position in biology. In the absence of these positions and to meet the current instructional demands additional adjunct faculty members have and continue to be hired. With respect to engineering and computer-aided design, it may be extremely difficult to find an instructor with skills to meet the needs of both series of courses and to meet the daytime instructional offerings. Further, with the anticipated agreement with the College of Engineering, CSU Long Beach to continue the Antelope Valley Engineering Program at the Lancaster University Center, it is critical for a full-time engineering instructor to be hired and provide the leadership needed for an accredited professional engineering program.

With respect to funds for material and supplies, the Division has experienced a 27 percent cut from 2008-09 to 2009-2010 academic years. In the absence of available Prop 20 funding this reduction in material and supplies funds would have had a devastating impact on instruction. These funds were largely expended by the first part of the spring semester and Prop 20 funds were used to complete the academic year. The funds were primarily used for the purchase of consumable supplies and little if any equipment has been obtained. Without access to Instructional Block Grant funds, no major equipment purchases have been made.

Some budget support has come from a generous Educational Partnership Agreement (EPA) with the Air Force Research Laboratory (AFRL) at Edwards Air Force Base. The EPA is currently

being rewritten for renewal. Title V has also provided funds to various areas of the division including a half-time evening and weekend technician in the biological sciences.

Degrees and Certificates Awarded

The Division of Mathematics, Science and Engineering teaches a wide variety of courses that fulfill a great many Associate degree requirements and the Intersegmental General Education Transfer Curriculum (IGETC). The degrees and certificates offered through the division are presented in Table 2. The Water Treatment non-credit courses have been declared obsolete and converted to credit courses that we anticipate will provide for a Degree or Certificate in Water Science with Chancellor's Office approval.

Table 2. Mathematics, Science and Engineering Degrees and Certificates.

Program	Degree	Certificate
Biological Sciences	X	
Drafting/Computer Aided Design	X	X
Engineering Technology	X	X
Mathematics	X	
Physical Science	X	
Geographic Information Systems (GIS)		X Local
Water Treatment	pending	pending

As summarized in Table 5, over 90 percent of degrees awarded in the division are awarded in Letters Arts and Sciences. As well, although far fewer certificates are awarded, the majority of these are awarded in drafting/CAD. The specifics of degrees and certificated awarded in each discipline and program will be presented later in this report.

General Goals for Division:

Goal: Develop transfer degrees in accord with SB1440
Objective: Increase the number of students earning mathematics, engineering or science degrees.
Timeframe: Ongoing; 3-5 years
Justification: Transfer students often elect to not complete degree requirement because they either 1) have too many units already in preparation for requirements of their particular mathematics or science major or 2) have multiple options of where they might transfer and each institution has different transfer requirements. Articulated degrees should reduce these problems.

Goal: Establish program to train adjunct and full-time faculty who are being evaluated or are selected as evaluators.
Objective: Provide consistent training to make the evaluation process more effective and productive.
Timeframe: 2011-2012 year
Justification: Although faculty is provided with printed information about the evaluation process

and the appropriate forms for evaluation, verbal instruction with the opportunity to discuss questions would increase the value of evaluations.

Goal: Develop environmental sciences AS.
Objective: Field ecology course is essential for the new Environmental Sciences degree (in development). The Animal Behavior course will increase student options for biology electives.
Time Frame: Submit paperwork to AP&P in 2011-2012.
Justification: An Environmental Sciences degree will help students to transfer to universities in order to train in this as future professionals in the environmental field. Also, by having other elective choices, biology (and other science majors) will have the opportunity to expand their educational horizon. Currently, the only electives available are Anatomy, Physiology, and Microbiology. These courses are highly impacted due to increasing demands from nursing.

Area 11 Recommendations and Comments

11.1 List recommended changes to the Educational Master Plan to:

- **Meet student needs.**
- **Respond to PLOs and SLOs.**
- **Reflect changes in the disciplines, educational methodology, and technology.**
- **Address external mandates such as state requirements, industry and professional standards, etc.**

The Educational Master Plan was completed recently and it reflects all the recommendations made in this review, thus no changes are recommended.

11.2 What changes in the program review process would improve institutional effectiveness or make the results more helpful the program?

Encouraging a better collaboration among different subgroups, with the chairs having a more active role in coordinating the effort, would improve program review. Faculty also suggest that it would be helpful if the college conducts workshops and a training program to prepare them for program review. The program review process is difficult yet recognized as important to reflect on the big picture rather than the day-to-day work of the semester. The template provided helped to ease the burden. Future iterations could be streamlined to ensure redundancy is eliminated. The division looks forward to working with other disciplines to develop a standard methodology for the program review process and evaluation procedures.

Standardization of data use and the way in which program review is conducted was identified as an area that needs to be improved during the most recent Accreditation self-study. Since a significant amount of statistical information is needed for program review, ongoing collaboration with the Institutional Research staff could easily lead to the creation of a template or form that could populate itself with AVC statistics relevant to each subject area as these were generated. A database program such as Microsoft Access would lend itself well to this type of application. This would work in a manner similar to the way in which Banner allows many individuals to access student information. Faculty with an understanding of database construction could be encouraged to collaborate with IR staff to implement this time-saving and useful template.

Program Area: Biology

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

Due to budget constraints in 2009-2010, courses were cut from the biology sequence (See Tables 3 and 4). Growth/expansion in the Associate Degree Nursing (ADN) program and the addition of Radiologic/Respiratory Technology programs has significantly increased the demand for Biology 201 and to a lesser degree Biology 202. Since Biology 101 is a prerequisite for Biology 201 and 202, there has been an increased demand for this course also.

There is also increased student demand for Biology 110 and 120. Due to space limitation these courses have only been offered on an alternating (Biology 110 in fall & Biology 120 in spring) pattern. Budget permitting, we will offer Biology 120 in the fall 2011and Biology 110 in spring 2012. This is a strain on the laboratory technicians as it increases to eight the number of different lab preparations required per week. It also requires them to maintain a tight schedule of set up immediately before a class and tear down immediately after, followed by immediate set up of another lab. It is expected when the new Health-Sciences building is completed that these courses will be more easily offered year round.

Significant enrollment increases in the past four years have led to an increase in Microbiology sections being offered to allow more students to get the courses needed to apply for the RN Program. General Microbiology (BIOL 204) primarily serves pre-nursing students looking to fulfill the science requirements required for entry into the two year RN program offered at many community colleges.

Table 3. Enrollment and Staffing Characteristics in the Biological Sciences 2006-2010.

Biology								
	2006-2007		**2007-2008**		**2008-2009**		**2009-2010**	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**296.5**	**285.1**	**313.5**	**292.5**	**317.5**	**308.5**	**317.6**	**265.5**
*Year Total	680.6		713.6		756		679.9	
Enrollment	**1366**	**1191**	**1380**	**1288**	**1488**	**1349**	**1450**	**1146**
*Year Total	2972		3078		3372		2950	
FTEF	**19.8**	**19.0**	**20.9**	**19.5**	**21.2**	**20.6**	**21.2**	**17.7**
*Year Total	45.4		47.6		50.4		45.3	
FTES	**321.6**	**280.7**	**320**	**294.1**	**343.1**	**313**	**334**	**279.5**
*Year Total	716.4		751.2		798.9		715.7	

*Year total includes summer before and intersession after the fall semester (e.g. Total is summer 2006, fall 2006, intersession 2007 and spring 2007).

Procedures to bring the care and handling of live animals into accordance with state codes and institutional standards are being considered.

Monitoring and reduction in hazardous solutions used in conjunction with preserved specimens

has been instituted along with improved safety policies and practices.

2.2 Briefly describe the program's activities and services in the past four years.

No entirely new courses and sections have been added, but CORs, lecture/lab content and methodologies of existing courses have been modified in keeping with scientific and technological advances. The safety protocol for all lab courses has been updated to meet with current standards.

Table 4. Number of Biology Sections Taught from Summer 2006 to Spring 2010.

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007**	**2007-2008**	**2008-2009**	**2009-2010**
BIOL 100 Elem Anatomy & Physiology	4	5	6	3
BIOL 100L Elem Anatomy & Physiology Lab.	9	9	10	6
BIOL 101 General Biology	26	28	31	30
BIOL 101L General Biology Laboratory	66	71	72	64
BIOL 102 Human Biology	3	3	3	3
BIOL 102L Human Biology Lab.	3	3	3	3
BIOL 104 Environmental Biology	5	5	5	3
BIOL 110 General Molecular Cell Biology	3	3	3	3
BIOL 120 General Organismal, Ecological & Evolutionary Biology	3	3	3	3
BIOL 201 General Human Anatomy	8	8	8	8
BIOL 201L General Human Anatomy Lab.	16	16	16	16
BIOL 202 General Human Physiology	5	5	10	8
BIOL 202L General Human Physiology Lab.	9	9	14	13
BIOL 204 General Microbiology	9	9	9	9
BIOL 204L General Microbiology Lab.	15	15	15	13
Total	**202**	**206**	**219**	**190**

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

Title V and AVC Foundation funds have helped replace some equipment including:

Fall 2009: Foundation Grant awarded for classroom set of iPods

Spring 2009: Title V Grant awarded for classroom set of MP3 players
Spring 2010: Two Foundation Grants awarded for lab equipment: one for microbiology sample preparation, the other for DNA analysis

The Title V grant is also funding a part-time technician for a period of time to help the biology laboratory technician with sample preparation and cleanup for evening classes.

Area 3 CURRICULUM

3.1 Identify degrees and certificates currently offered in the program.

The Division of Mathematics, Science and Engineering teaches a wide variety of courses that fulfill a great many Associate degree requirements and the Intersegmental General Education Transfer Curriculum (IGETC). Degrees and certificates offered through the division have been summarized in the overview to this report.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

Biology 101 Honors has been offered yearly (as opposed to every second year) since spring 2008 to meet greater demand for honors sections. Honors options are offered in Biology 102 and Biology 104.

Biology 101 (General Biology), 201 (General Human Anatomy) and 204 (General Microbiology) are offered as hybrid online sections. A hybrid Biology 102 is in development.

Biology 202 (General Human Physiology) is offered online, with both lecture and lab available.

General Human Anatomy (BIOL 201) and General Human Physiology (BIOL 202) continue to be the courses with the greatest enrollment demand. General Human Anatomy is a gateway to other requisite courses for application to the Associate Degree Nursing Program (ADN). The class is full within days of the opening of priority registration. Recently as many as 75 students attempted to "crash" a single section of the course. Laboratory space in the four biology rooms is fully scheduled from 7:45 a.m. Monday morning to Saturday afternoon at 5:20 p.m. At present the anatomy–physiology program (laboratory SC2 140) is unable to respond to these enrollment pressures; however, the new Health & Sciences building (anticipated occupancy August 2012) will provide separate anatomy and physiology laboratories and hence an opportunity to greatly expand available student seats.

In an effort to provide some access to some biology courses at the Palmdale Center, the online BIOL 202, BIOL 202L and BIOL 101 meets there when meetings are required. Because the dry science lab at the Palmdale Center cannot accommodate biology experiments, biology lab courses can only be offered at the Lancaster campus.

Night options are offered for all biology courses. There are Saturday-only sections of Biology 101. Hybrid options with online lecture and in-class lab are offered for Bio 101, 201 and 204. Bio 202 is offered with both online lecture and lab.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

Podcasting (by some instructors) of Biology 101, 201, and 202 is now routinely offered. Many biology instructors post their lecture notes online. Use of simulated and real video media, available through text publishers, internet and smart phone apps continues to expand. These enrichments, in addition to the online/hybrid course offerings for BIOL 101, 201, 202 and 204, allow students with diverse learning styles to find a learning environment suitable to their needs and schedules.

3.4 Recommend ways to improve completion of certificate, major, and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

With the exception of BIOL 102, 110 and 120 which are offered on a rotational basis, all biology courses approved for certificate, major, or transfer requirements are offered at least every fall and spring. Completion of the Health & Sciences building will facilitate increasing course offerings to meet student demand.

3.5 Are all CORSs current?

As of fall 2010, all Course Outline of Record (CORs) are current and can be viewed at http://www.avc.edu/administration/organizations/app/mscors.html#biology

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Faculty members match the Course Outline of Record (COR) with material in textbooks currently in use, section by section. When hired, faculty are provided with CORs of their assigned courses. Effort is made at division meetings, informal peer interaction, and faculty evaluations to communicate the importance of covering material as described in the COR.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

- Support services such as Supplemental Instruction (SI), Instructional Multimedia Center (IMC) and faculty websites continue to be effective and widely used.
- The Learning Center offers students the opportunity to obtain assistance with the reading, writing and mathematics skills necessary to succeed. In addition, SI leaders and tutors in the subject areas may be contacted at the Learning Center.
- Classroom technologies such as LCD projectors and monitors, video presenters and computer simulations are in wide use. New microscopes were acquired a few years ago, which replaced older microscopes. However, it is recommended that we invest in a few

Digital Video Microscopes that can be used in a variety of courses.

- Many office and lab computers are outdated which limits attempts to incorporate new software or technologies.
- Lab space continues to be an extremely limiting factor, despite the move to some online, evening and Saturday labs. Completion of the new Health & Sciences building is expected in time for the fall 2012 semester which will rectify this long-standing problem.
- No district capital outlay funds have been available since the 2007 program review. This has led to deterioration or loss of anatomical models and animal housing and worsening malfunction of instrumentation and microscopes.
- Staff development and travel allowances have been drastically cut, preventing attendance at state or national conferences.
- Wi-Fi services would greatly expand and simplify access to teaching/learning tools.

4.2 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

Recent addition of an evening life science lab tech has improved placement and maintenance of lab materials. Furthermore, addition in 2008 of three more full-time instructors that teach Microbiology, Organismal Biology, and Anatomy & Physiology has been helpful.

Area 5 Data Analysis and Environmental Scan (Updated annually)

1. **5.1 The program was provided with a substantial amount of data from the Office of Institutional Research and Planning. The self-study team should review and have a dialogue on the data and then identify major changes or enrollment trends expected to be of particular relevance to the program in the next four years. Consider WSCH/FTES, success, retention and persistence as applicable, and the number of degrees and certificates, if applicable. Consider data on gender, age, ethnicity, night vs. day, etc.**
   a. **Write about enrollment trends that the self-study team believes are important to the program's planning and resource needs. Why might these trends be occurring?**
   b. **Considering these trends, how well is the program doing in meeting the needs of the various learner populations attending the college?**

There are more female students taking biology classes (all groups) than males (about 3 to 1 ratio). A possible explanation is that most of these students are going into traditionally female-dominated health professions (nursing, respiratory technology and radiology). There has been a slight drop in both genders likely attributed to sections being cut due to budget constraints. With respect to ethnicity, the student population totals have been 39.3% White, 36.2% Hispanic, 13.3% African-American, 8.6% Asian/Pacific Islander and 1% Native American/Alaskan. A significant proportion of students (11.6%) are either unreported or have stated "Other" as their ethnicity, creating some uncertainty as to the relevance of the data as it is presented. Compared to the ethnicity of the campus as a whole, the biology area serves a higher percentage of Whites, Hispanics and Asian/pacific Islanders. There are fewer African-American students in biology compared to the campus population. Finally, it is difficult to report on year-to-year trends in data because of the 2009 change in coding of ethnicity categories defined by the Chancellor's office.

By age, 31.3% of students in Biology are less than 20, 36.8% between 20 and 24, 12.2% are 25-29, 6.7% are 30-34, 4.7% are 35-39, 6.3% are 40-49, and 2% are 50 years old or older. These values are similar to the age data from the 2009 Fact Book; the only exception being that fewer people 50 years and older are enrolled in biology courses. The biology student age demographic mirrors the campus, in general, with an increasingly younger population. A possible explanation is that, due to the current economic climate, more students opt to attend community college close to home and transfer to university after completing their general education and lower division major's courses. Thus, it is recommended that course offerings at AVC increase, budget permitting, in order to meet this demand.

Retention rate in most courses is high (mid 80 to 90 percentiles). The only class that has seen a steady drop in retention is BIOL 120. The highest number of Biology degrees awarded was 2008-2009, with lowest being 2009-2010 (Table 5). This is most likely due to the fact that fewer students are able to get into this major's courses (both 110 & 120) due to lack of sections. There are only 3 sections of each course offered on alternating manner. However, it is anticipated that with the opening of Health & Sciences building this problem will be remedied.

Table 5. Divisional Degrees and Certificates awarded each Academic Year from 2005-2010.

Associates Degrees	**Disciplines**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**
Arts	LAS: Math and Sciences	0	0	0	31	26
	Letters, Arts, and Sciences	408	518	502	345	83
Science	Biological Sciences	22	17	18	31	4
	Drafting/Computer Aided Dsgn	6	2	1	3	4
	Engineering	1	0	1	0	0
	Engineering Technology	1	0	1	1	0
	Mathematics	12	12	4	9	9
	Physical Sciences	4	5	5	2	3
Certificates						
Chancellor Approved	Drafting/Cmptr Aided Dsgn	3	2	0	3	7
	Engineering Technology	0	0	0	1	0
Local	Geographic Info Systems local	0	1	5	4	0

5.2 Report on the progress of recommendations and accomplishment of goals identified in the program's last program review. Reflect on the strengths, weaknesses, and improvements of the program. Clearly state the performance/quality indicators used by the program.

The addition of three full-time faculty members since 2008 has reduced overload and adjunct teaching and improved laboratory operations and safety. Additional half-time laboratory technical assistance through a Title V grant has also eased the burden on the two full-time laboratory technicians who currently serve 58 biology lab section offerings in 6 course offerings.

Area 6 Student and Program Learning Outcomes (PLO) Assessment (Updated annually)

6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

Biology faculty have entered and assessed SLOs for all Biology courses offered since 2008, and have been doing so for every cycle since then. Documentation has been updated for the 2009-2010 cycle to include labs as part of the assessment of their associated courses. According to the CORs for the biology courses, the overall course includes lab and lecture sections. In the 2008-2009 cycle, labs were erroneously listed as separate entities. Other than comments on WEAVE regarding assessment of particular SLOs, more documentation may be needed for decisions taken by faculty on actions for improving student learning.

Program learning outcomes have been developed for biology and all faculty have had the opportunity to review and discuss them. It is expected that PLOs will be in place by the end of the 2010-2011 academic year.

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Regular faculty workshops, cooperative development of and adherence to SLOs help ensure consistent utilization of CORs. A biology faculty member who serves on the SLO committee actively contributes to this area. All faculty are on a regular schedule of classroom observations and evaluations to ensure that class content is adequately covered.

Adjunct faculty have participated in gathering SLOs for BIOL 101 in the past cycles. They have been informed about the importance of the SLOs through e-mails and personal contacts, as well as departmental meetings for those who attended. They are considered an important component of the SLO gathering process. However, not all adjunct faculty actively participate at this time.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

The goal for the next four years is to have 100% compliance for SLO reporting. SLOs for all Biology courses offered for each academic year will be assessed every annual cycle, with data coming from faculty, both full time and adjunct.

PLOs are being established for the program. The goal is to have PLOs established and an assessment plan in place by Spring 2011.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

Tables 5- 9 report SLO data for some biology courses from Fall 2009 through Spring 2010.

Table 6. Biology 101 has seven SLOs. The achievement target for SLOs is for 60% of students to correctly answer 67% of questions (6 /SLO) for each SLO. The assessment was made by looking at the results of the 6 SLO questions embedded in various exams.

SLO	Number of Students assessed (# of sections)	BIOL 101 Assessment	Target
1	238 (6)	78% of students achieved target	Met
2		Not assessed in 2009-2010 cycle	
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	
6	390 (8)	68% of students achieved target	Met
7	331 (7)	80% of students achieved target	Met

Table 7. Biology 104 has five SLOs. The achievement target for SLOs is for 65% of students to correctly answer 70% of questions for each SLO.

SLO	Number of Students assessed (# of sections)	BIOL 104 Assessment	Target
1	Not available	59% of students achieved target	Not Met
2	Not available	73% of students achieved target	Met
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	

Table 8. Biology 110 has eight SLOs. The achievement target is for 70% of students to achieve 70%.

SLO	Number of Students assessed (# of sections)	BIOL 110 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2		Not assessed in 2009-2010 cycle	
3	68 (2)	53% of students achieved target	Not Met
4	67 (2)	57% of students achieved target	Not Met
5		Not assessed in 2009-2010 cycle	
6	68 (2)	53% of students achieved target	Not Met
7		Not assessed in 2009-2010 cycle	
8		Not assessed in 2009-2010 cycle	

Table 9. Biology 120 has eight SLOs. The achievement target for is for 67% of students to correctly answer 67% of questions for each SLO.

SLO	Number of Students assessed (# sections)	BIOL 120 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2		Not assessed in 2009-2010 cycle	
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	
6		Not assessed in 2009-2010 cycle	
7		Not assessed in 2009-2010 cycle	
8	13 (1)	77% achieved target (oral) 46% achieved target (written)	Partially Met

Table 10. Biology 204 has seven SLOs. For SLOs 1 & 2 success is that 60% of the students achieve a 70% or more in the lab course. SLOs 3-7 are assessed based on 60% of the students achieving a 70% or more on exam questions.

SLO	Number of Students assessed (# sections)	BIOL 204 Assessment	Target
1	240 (10)	63% of students achieved target	Met
2		Not assessed in 2009-2010 cycle	
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5	240 (10)	70% of students achieved target	Met
6		Not assessed in 2009-2010 cycle	
7		Not assessed in 2009-2010 cycle	

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

Collaboration with and greater dependency on the IMC continues. Their services in media duplication, podcast uploading and equipment maintenance are vital. Unfortunately, intervention by ITS personnel has hampered and even suspended lecture Podcasting and generally undercut IMC services on more than one occasion.

The division is responsive to needs of students in the TAP/Honors Program. A biology faculty member serves on the Honors Committee.

Many courses in this program utilize the resources provided by the Learning Center, including SI

and general tutoring. There is a tremendous need to keep tutoring services available for students, particularly in Biology 101, 201, 202 and 204. Furthermore, collaborations with OSD, the library, EOPS, and STAR continue. AVConnect is being used in one section of Bio 201, and one biology faculty member, serves on the Basic Skills Committee.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

There are currently no outreach programs pertaining to the biology program. However, some courses (Biol 101 & 104) fall under general education requirements and are thus advertised to students via other institutions on campus. The biology department works closely with the faulty member teaching biology at SOAR High School. An Educational Partnership Agreement with the Air Force Research Lab at Edwards Air Force Base (AFRL-EAFB) is currently under development. This will facilitate material support as well as interaction among students, faculty and research scientists. Biology faculty members actively participate in the NASA Bohn-Meyer Math and Science Odyssey, I'm Going to College, and similar events, encouraging younger students in the Antelope Valley K-12 school districts to sample new experiences in the areas of mathematics and science.

Area 9 Goals and Objectives (Updated annually)

Goal 1: Offer Biology 110 & 120 year round
Objective: Facilitate transfer of health and science majors to four-year degree granting institutions.
Time Frame: Fall 2011
Justification: Increased student demand and need to offer more flexibility in scheduling.

Goal 2: Develop new biology course in Field Ecology and Animal Behavior.
Objective: Field ecology course is essential for the new Environmental Sciences degree (in development). The Animal Behavior course will increase student options for biology electives.
Time Frame: Submit paperwork to AP&P by Fall 2011.
Justification: An Environmental Sciences degree will help students to transfer to universities in order to train in this as future professionals in the environmental field. Also, by having other elective choices, biology (and other science majors) will have the opportunity to expand their educational horizon. Currently, the only electives available are Anatomy, Physiology, and Microbiology. These courses are highly impacted due to increasing demands from nursing.

Goal 3: Improve student success in SLOs and introduce students to techniques and equipment found in modern laboratories.
Objective: Develop new and improve existing laboratory assignments. Acquire new computers and data collection devices.
Time Frame: Open (dependent on grant awards)
Justification: To ensure AVC students are prepared for upper division biology courses, and for the laboratory workplace.

Goal 4: Enhance the Anatomy and Physiology offerings at AVC.
Objectives: Offer additional sections of Biology 201, General Human Anatomy, both conventional and hybrid online**.** Expanding the anatomical collection (see Area 10.2). Acquire new computers and data collection devices for Biol 202 (see Area10.2)**.** Create new courses or expand existing courses to meet the needs of Health-Science programs (e.g. cross-sectional anatomy).
Time-frame: Ongoing, beginning 2012 with completed construction of the Health-Sciences building.
Justification: The need in the community for foundational sciences courses to support nursing education has been illustrated by the increased number of for-profit institutions now offering anatomy and physiology courses. These courses have not been deemed equivalent to those at AVC as they lack prerequisites and involve less instructional contact hours and substandard laboratory experience.

Goal 5: Offer additional sections of Microbiology.
Objectives: To continue to provide instruction in both the theoretical aspects of Microbiology and in laboratory practices for as many students as possible,
Time-frame: After completion of the Health-Sciences building.
Justification: To meet the demand of students preparing for the RN Program and other Health Science careers.

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

It is recommend that one full-time biology faculty with specialty in botany and another full-time faculty in molecular biology to be added to the program. Currently the state higher education system is being remapped to facilitate student transfers. Many biology programs require three undergraduate biology core courses. We currently only offer Biology 110 & 120, with botany being covered in the latter course. By having a specialist teach our botany class, we can expand the topics that are covered in Biology 120, thus being able to keep up with new developments in this field. In addition to this content area need, 37% of biology courses are taught by adjunct faculty or overload.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to

provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

Biology

- Digital microscopes - Computer, video, photo microscopes and photo printers for capturing images and conducting measurements by the students and displaying slides for the whole class be the instructor.
- Florescence microscope for Biology 110.
- Cool-light fiber optic illuminators to be used with our newly acquired dissection-scopes (stereomicroscopes). Better illumination will allow the students to see more structural details.
- Respirometer for measuring oxygen consumption by various organisms.
- Calibrated stage micrometers along with oculars reticules.
- New Gel Electrophoresis Equipment for Biology 110.
- Vertebrate (amphibian, reptiles, etc.) osteological specimens to be used in the comparative morphology lab in Biology 120.
- MultiLogPRO or Nova or TriLink data logger for measuring photosynthetic rate in plants under various conditions.
- HGS Molecular Structure Model (C sect for organic chemistry) W.H. freeman & Company (X10)
  High-speed digital camera to allow students (biology majors) to conduct in class experiments analyzing animal behavior.

For Anatomy & Physiology, in order of their importance, the following equipment needs are projected:

1. Replacement of 6 lab computers for data acquisition.*
2. Replacement of 24 student microscopes, now over 30 years old.
3. Replacement of deteriorating animal cages, now over 50 years old.
4. Replacement of faculty office computers, most over 6 years old.
5. Replacement of anatomical torso with a full-body, dissectible mannequin
6. Replacement damaged and worn skeletal material used in anatomy.
7. Replacement and expansion of anatomical models
8. Addition of laptop for use in Sc2, Rm 140
9. Replacement of 6 data collection devices (PowerLab®).
10. Replacement of DVD/VCR players
11. Addition of new DVD programs covering human dissection and A&P topics.
12. Replacement of cadavers (as needed)

*now being negotiated

10.3 Identify funding needed to support student learning.

Funding through grants and community partnerships will be pursued.

Program Area: Chemistry

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

In Spring 2007, Introductory Chemistry, CHEM 101 was re-established as one course incorporating lecture, lab, and small assembly session (SAS). This was necessary due to developments in teaching methods such that the instructor actively engages students in inquiry based-learning techniques during all segments of the course. For CHEM 102, which did not have a small assembly section, the lecture and lab were combined into one course. This had already been done for the other chemistry courses.

Table 11. Enrollment and Staffing Characteristics in Chemistry 2006-2010.

Chemistry								
	2006-2007		**2007-2008**		**2008-2009**		**2009-2010**	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**105.5**	**103**	**135**	**154**	**142.1**	**143.3**	**143.2**	**108**
*Year Total	252.5		352		328.4		304.2	
Enrollment	**375**	**407**	**452**	**475**	**522**	**522**	**539**	**433**
*Year Total	952		1123		1234		1158	
FTEF	**7.0**	**6.9**	**9**	**10.3**	**9.5**	**9.6**	**9.5**	**7.2**
*Year Total	14.3		23.5		21.9		20.3	
FTES	**94.6**	**102.4**	**114.6**	**128.9**	**136.4**	**133.5**	**150.7**	**113.7**
*Year Total	265.8		370.5		345.7		320.2	

*Year total includes summer before and intersession after the fall semester (e.g. Total is summer 2006, fall 2006, intersession 2007 and spring 2007).

2.2 Briefly describe the program's activities and services in the past four years.

The annual enrollment and scheduling characteristics in chemistry is presented in Table 11. As well, the list of courses and sections offered is presented in Table 12. Due to budget constraints in the 2009-2010 academic year, courses were cut from the chemistry sequence. In the 2010-2011 year, instructors noted that the number of students attempting to enroll in CHEM 101 (Introductory), 110 (General), and 210 (Organic) was even greater than in previous years, but the numbers of students in CHEM 120 (General, second semester topics) had declined since fewer students were able to complete the CHEM 110 prerequisite in spring and summer semesters in 2010. CHEM 110 is also a prerequisite for BIOL 110.

Demand for CHEM 102 (Introductory Organic Chemistry), which had declined for a few years, is again on the upswing. Students are asking for additional sections as they are being counseled that the course is valuable preparation for a bachelor's degree in nursing.

Table 12. Number of Chemistry Sections Taught from Summer 2006 to Spring 2010.

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007***	**2007-2008**	**2008-2009**	**2009-2010**
CHEM 101 Introductory Chemistry	22	37	37	34
CHEM 101SA Introductory Chemistry Small Assembly	15			
CHEM 101L Introductory Chemistry Lab.	17			
CHEM 102 Introductory Organic Chemistry	4	3	2	1
CHEM 102L Introductory Organic Chemistry Lab.	2			
CHEM 110 General Chemistry	6	12	11	10
CHEM 120 General Chemistry	3	5	5	4
CHEM 210 Organic Chemistry	2	1	1	1
CHEM 212 Organic Chemistry Support Lab			1	
CHEM 220 Organic Chemistry	1	1	1	1
Totals	**70 (38**)**	**59**	**58**	**52**
CHEM 199 Work Study (number of students enrolled)	2 students	2 students	2 students	1 student

* In Spring 2007, chemistry courses were revised such that the corresponding labs, lectures and in some cases, small assembly, were combined into just one section for each course. To accommodate students who needed to retake just lecture or lab, within an instructor's section, the students were assigned a CHEM X code so that the student could be tracked separated. Because these were not additional sections of Chemistry classes, but only categories to track a student(s) within a section, these codes were not included in this table.
**Complete sections if courses in Fall 2006, Summer 2006, and Intersession 2007 had been counted as in subsequent semesters with one section including lecture, lab, and in some cases small assembly.

2.3 Did the program receive outside funding during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

A scanning UV-vis spectrometer, purchased by the Air Force Research Lab (AFRL), and software to operate it, purchased by the AVC Foundation, improved access for Organic Chemistry students and opened access for General Chemistry students to an instrument that is common in most research labs.

Hot plates, pH meters, and lab consumables were also purchased by AFRL. When the Title V grant replaced laptops in the physical sciences area, the older laptops were used to replace the failing set in the chemistry area. With these acquisitions, students can now perform lab procedures in reasonably sized groups. Hands-on activity increases student learning.

The Title V grant also funded a part-time student worker for a period of time to help the

laboratory technician bring the chemical storage area into compliance with safety regulations.

Area 3 CURRICULUM

3.1 Identify degrees and certificates currently offered in the program.

An AS Degree in Chemistry is under consideration because there currently is no specific chemistry degree. Students may select chemistry courses to complete requirements for the AA in Liberal Arts and Sciences. The AS in Physical Sciences requires CHEM 110 and 120.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

CHEM 212 (Organic Chemistry Support Lab) was removed from the schedule due to budget cuts. Organic chemistry instructors continue to offer supervised lab time without compensation to insure that students have adequate opportunity to develop lab skills. This supports ILO 2.

It was expected that CHEM 205 (Analytical Chemistry) would be offered for the first time in spring 2011, but budget constraints suggest it be launched when the new health and science building is available. The building will have a dedicated instrument room and some features that make the course less costly to run. Community employers had originally requested this course as a means to train their lab technicians and students who could be potential employees. CHEM 205 would be a required course in an AS chemistry degree. The course will also be included in the Environmental Science Program, which is under development among several of the science disciplines.

Organic Chemistry, CHEM 210, class will be offered in Spring 2011 to accommodate a large number of students requesting the class. Offering CHEM 210 in both fall and spring semesters was tried in past years but enrollment was not sustained. Student demand for organic chemistry seems to be increasing again. The course will be offered at night to reach students who traditionally may not have been able to take the daytime offering.

A section of CHEM 101 lecture was held at the Palmdale Center in an effort to make science more accessible to the Palmdale community. Due to the specialized equipment, students were still required to take lab at the Lancaster campus. Students told the instructor that they were pleased to have a course in Palmdale, even if only the lecture portion.

The chemistry class at SOAR High School has been revised to include all content and the exact lab experiments as CHEM 101. Students may now earn college credit from their year of high school chemistry through an articulation agreement with the AV Union High School District.

To accommodate students in the TAP/Honors Program, instructors offer an honors option in CHEM 110, 120, 210, and 220.

Courses are offered to fit daytime, nighttime and Saturday only schedules. CHEM 101 continues to be offered as a hybrid class with the lecture and small assembly portions on-line and the lab on-ground.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

Faculty interest in inquiry-based teaching methods has increased significantly. During summer 2010, six chemistry instructors attended at least part of a workshop hosted by Title V for Antelope Valley Union High School District (AVUHSD) and AVC science teachers. Monthly follow-up sessions continue. These and other instructors are working to revise curriculum towards this model.

Several faculty assign homework from online programs that correlate with course textbooks. Although this is an inconvenience for students who do not have ready Internet access at home, the format provides immediate feedback for students learning to solve chemistry problems.

Certain lab instruments are currently underutilized. Faculty professional development for use and maintenance of these instruments would increase opportunities for students to work with these instruments within the curriculum as well as for honors and work study projects.

3.4 Recommend ways to improve completion of certificate, major, and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

To support the implementation of SB1440, the AS in Physical Science will be reviewed. Establishment of an AS in Chemistry would afford students the opportunity to transfer seamlessly to an institution offering a bachelor's degree in chemistry.

It is recommended that a small assembly section be added to CHEM 102. All of the chemistry courses meet for seven or nine hours per week, with the exception of CHEM 102, which meets for only six hours. Adding a 50-minute small assembly section would extend to the class the same access to the instructor as provided to chemistry students in other courses.

CHEM 102 is offered only once per year. With increasing demand for this course by students pursuing the BSN degree in nursing, it will need to be offered more frequently in the future.

The addition of CHEM 210 to the spring semester is highly beneficial to students. When this course is offered only in fall semester, some students have to remain at AVC for an extra year in order to complete their transfer requirements. Restoring CHEM 110 to the summer schedule would enable more students to take the sequential CHEM 120 in fall semester, followed by Organic Chemistry in spring.

3.5 Are all CORSs current?

CHEM 205 and 110 are updated. CHEM 101, 102, 120, 210, 212 and 220 will be updated by the end of spring 2011.

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Before new faculty teach a section of a course, they are provided with the COR, SLOs and samples of approved syllabi from other instructors of that course.

During the evaluation process for both adjunct and full time faculty, syllabi are reviewed in the context of the Course Outline of Record and Student Learning Outcomes.

When CORs are revised, input is solicited from instructors who regularly teach that course, not just one primary instructor.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

The Learning Center provides tutors for all chemistry courses. Supplemental instructors are regularly available for CHEM 101 and occasionally for other courses. Students who take advantage of these resources consistently report that they are of great benefit.

The campus Assessment Center can proctor make-up exams for students. Utilizing this campus resource saves instructors' time and ensures integrity of the exams.

When a student requests assistance for a protected disability, faculty have found it easy to work with the Office of Students with Disabilities.

Due to the low number of students interested in honors chemistry, rather than a full class, honors options are offered by various instructors. Instructors who agree to these projects commit several hours per semester to advise students, supervise their activities in the laboratory and review their work. While this is rewarding on a personal level, there would be additional incentive for instructor participation if such work could be counted towards Faculty Professional Development hours. The Chancellor's website (http://www.cccco.edu/Portals/4/AA/Flexible%20Calendar/Flex_Calendar_Guidelines_04-07.docx.pdf) indicates that advising and mentoring students are approved FPD activities. Perhaps coordination with the local FPD committee could result in guidelines that would make the committee comfortable to recognize supporting students in an honors option as a valid FPD activity.

4.2 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

A safety policy to bring science labs into compliance with state and federal standards, was drafted and is being tested. It more thoroughly details responsibilities of lab technicians, instructors, and students in maintaining a safe, clean lab. When this draft becomes policy, lab personnel will receive annual safety training. The increased emphasis on laboratory safety and hygiene will better prepare students for other lab courses and future jobs.

Since the last program review, installation of permanent computers and projectors has been accomplished in each classroom. This improves student learning as instructors can now use animations, computer models, real-time data collection, and other visual aids.

Area 5 Data Analysis and Environmental Scan (Updated annually)

5.1 The program was provided with a substantial amount of data from the Office of Institutional Research and Planning. The self-study team should review and have a dialogue on the data and then identify major changes or enrollment trends expected to be of particular relevance to the program in the next four years. Consider FTES/WSCH data, success, retention and persistence as applicable, and the number of degrees and certificates, if applicable. Consider data on gender, age, ethnicity, night vs. day, etc.

a. Write about enrollment trends that the self-study team believes are important to the program's planning and resource needs. Why might these trends be occurring?

b. Considering these trends, how well is the program doing in meeting the needs of the various learner populations attending the college?

The chemistry student population closely resembles the demographics of the college as a whole, as presented in AVC's 2009 Factbook. For example, 59% of students at AVC are female. Data indicate that 62% of chemistry students are female.

In 2009-2010, nearly 1% of chemistry students were American Indian or Alaskan Native. The largest ethnic group of chemistry students, 30%, is "White non-Hispanic". Students identifying themselves as Hispanic comprise 25% of the remaining percentage. "Other and unknown" is the next largest group with 25%, Black Non-Hispanic 11% and Asian or Pacific Islander 7% of the total. These numbers compare to the 2009 Factbook statistics as 1% American Indian, 4% Asian or Pacific Islander, 16% black, 24% Hispanic, 25% white non-Hispanic and 30% other or unknown. Chemistry faculty work with AVC's Outreach office to encourage students of all ethnicities to succeed in STEM related subjects. Instructors promote programs like the American Chemical Society's Scholars Program with scholarships for African American, Hispanic, and American Indian chemistry students. It is difficult to report on year-to-year trends in data because of a change in the coding of ethnicity categories defined by the Chancellor's office in 2009.

By age, 36% of students are less than 20, 36% between 20 and 24, 12% 25-29, 6% 30-34, 4% 35-39, 5% 40-49, and 1% 50+. This indicates that on average, chemistry students are slightly younger than the typical AVC student.

The chemistry faculty requested a study to determine whether MATH 070 (Elementary Algebra), which is currently an advisory, should be set as a prerequisite for CHEM 101. Results from this study conducted by the Office of Institutional Research indicated that Math 070 does not need to be a prerequisite for CHEM 101. This was shocking to instructors who observe that students who have completed MATH 070 before attempting CHEM 101 are much better prepared. Since 2007, when CHEM 101 lab, lecture and SA were combined into one class, student success ranged from 58% to 75% in that course during fall and spring semesters. Summer and intersession success rates are generally higher.

Success in CHEM 110 ranges between 52 and 87%. For CHEM 120, the range is 66-82%. With CHEM 102, 210, and 220, there are occasions when 100% of the students succeed. The individualized attention available to students in a smaller class may explain these differences.

Retention for chemistry classes generally does not fall below 80% with some smaller classes having perfect retention. One notable exception is in Fall 2008 when both retention (41%) and success (35%) in CHEM 120 were far below average due to a problematic instructor. The instructor no longer teaches at AVC.

Data indicate that too few students earn degrees in science from AVC. Only 13 AS degrees in Physical Sciences have been awarded since 2006. Division faculty should make a concerted effort, with support from the counseling and transfer offices, to increase the number of students working towards this award. Students may not be aware of the available degrees or the benefits of attaining such a degree. Efforts in support of SB1440 may quickly improve this deficiency as more degree options will be offered and will correlate directly with certain four-year degrees.

5.2 Report on the progress of recommendations and accomplishment of goals identified in the program's last program review. Reflect on the strengths, weaknesses, and improvements of the program. Clearly state the performance/quality indicators used by the program.

An environmental chemistry course, and a one-semester health science oriented introductory chemistry course have not been accomplished since proposed in the previous program review. There is still potential interest in the environmental chemistry course, which could be a required course in an environmental science degree or certificate being developed to include biology and geology courses as well. There is less enthusiasm for the one-semester general, organic, biochemistry course. Emphasis has shifted to encouraging students to take two semesters of introductory chemistry as CHEM 101 and CHEM 102. This idea has the support of instructors in 200-level biology courses who note that CHEM 102 (Introduction to Organic Chemistry) gives students valuable preparation for those courses which are also prerequisites for the nursing program.

As noted in Area 8, articulation with high school chemistry was a goal that has been met with SOAR High School.

A portion of the chemistry stockroom has been converted into an office for all faculty. It is a convenient place to hold office hours, to store personal belongings, to use a computer and to share resources (books, notes, etc). However, some faculty are concerned that it is too secluded and therefore do not hold office hours there. Other faculty have requested that locks be added to the drawers in which personal items are stored. When the new Health and Sciences building is opened in summer 2012, all faculty members with offices in other parts of the campus will presumably be relocated to offices near the chemistry classrooms. An office should be set aside for adjunct faculty. These actions will eliminate the need for the extra meeting space currently used in the stock room.

Area 6 Student and Program Learning Outcomes (PLO) Assessment (Updated annually)
6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

Program learning outcomes are being developed for the AS in Physical Sciences. It is expected that PLOs will be in place by the end of the 2010-2011 academic year.

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Through email, specific meetings, and inclusion on the agenda of regular department and division meetings, faculty are continually apprised of SLO development and assessment. Many adjunct instructors contributed questions to SLO assessment tools. Adjunct instructors, like full time instructors, conduct SLO assessments in their classes regularly and forward collected data to the fulltime faculty assigned to update WEAVE.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

For at least four semesters, all but one SLO for CHEM 110, 120, 210, and 220 have been assessed. In each class, the SLO not assessed pertained to lab practical skills. Assessment tools for the lab-related SLO in these courses and for CHEM 101 were developed as a result of meetings in summer and fall 2010. Therefore, all SLOs for CHEM 110, 120, 210, and 220 will be assessed by the end of Fall 2010.

In addition to the lab-related SLO for CHEM 101, an assessment tool for half of the remaining SLOs was developed with consensus from instructors of the course. Data collected from this assessment has not yet been analyzed. Assessment for the remaining SLOs is being developed.

CHEM 102 was not offered in the 2009-2010 assessment cycle. Assessment for this course will occur in Fall 2011.

PLO assessment methods for the AS in Physical Sciences will be developed in collaboration with the other science areas at the time that the PLOs are finalized. This should be accomplished by the end of the 2010-2011 academic year.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

Tables 13-16 show the results of SLO assessment for the 2009-2010 assessment cycle.

Table 13. CHEM 110 has six SLOs. The achievement target for SLOs 2-6 is for 70% of students to correctly answer 60% of a question. Assessment was made by comparing results from a standardized test developed by the faculty, administered as pre- and post-tests. Data from pre-tests indicate 0% success for SLO 2-6. Post-test results are:

SLO	Number of Students assessed	CHEM 110 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2	107	91% success	Met
3	107	76% success	Met
4	107	71% success	Met
5	107	63% success	Not Met
6	107	37% success	Not Met

Success for SLO 3 and 5 could be improved by incorporating more activities based on Spartan Pro, a molecular modeling program that allows students to visualize molecules, to identify the most reactive portions of molecules, and to investigate different chemical bonding theories. Four copies of a version of this program are currently used for a lab based on molecular modeling. This means that students work in a group of six. Additional copies, of the upgraded version, would improve student access to this important tool. **Budget Amount Requested**: to upgrade old copies and add new copies $5000 (HIGH PRIORITY, also impacts CHEM 220 SLOs and all other chemistry classes.); 12 Labtop computers or netbooks (connect with Vernier lab interfaces, FTIR, and UV/vis instruments) total $6,000 (HIGH PRIORITY, also impacts CHEM 220 SLOs. Additionally, all chemistry classes will benefit from greater access to computers.)

Instructors concluded that the assessment question for SLO 6 needed revision. The question was amended for Fall 2010 assessment.

Table 14. CHEM 120 has six SLOs. The achievement target and assessment method are identical to those for CHEM 110. Data from pre-tests indicate 0% success for SLO 2-6. Post-test results are:

SLO	Number of Students assessed	CHEM 120 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2	39	13% success	Not Met
3	39	40% success	Not Met
4	39	80% success	Met
5	39	65% success	Not Met
6	39	49% success	Not Met

For Fall 2010, an additional lab activity relating to solutions will be added to the schedule to address SLO 2. Physical models capable of representing solute solvation and ion dissociation would also help students learn the topics involved in SLOs 2 and 6. The department currently has animations to show solvation, but models to physically manipulate would help students visualize concepts like dilution and ion dissociation. **Budget Amount Requested:** $800.00

Lab activities related to SLO 2 and 3 would be improved if automatic pipetters were available for students rather than traditional glassware. Through the years, volumes of solutions have been

reduced to more wisely use resources and to minimize waste generation. At smaller volumes, the error in the traditional glassware increases. When student data has too much error, it is impossible to draw the expected conclusions from lab data. The lab then becomes a source of confusion rather than a learning experience. Autopipetters provide much more accurate measurement so that lab results will be useful. **Budget Amount Requested**: 24 autopipetters and supply of pipette tips $7000.

Because the assessment question for SLO 5 required conversions and knowledge that was not specific to the outcome, this question was revised for the cycle starting in Fall 2010.

Success in SLO 6 would also be augmented by acquisition of a second FT-IR. Currently, there is only one FT-IR available to a class of 24 students. This instrument would be used by CHEM 210 and CHEM 220 students too. **Budget Amount Requested:** Nicolet iS10 FT-IR $20,000

Table 15. CHEM 210 has six SLOs. SLOs 1-4 are assessed with an instructor-written test given at the start and end of the semester. Data from pre-tests indicate 0% success for SLOs 1-4. SLOs 5 and 6 are assessed from laboratory notebooks submitted on a weekly basis. The notebooks are evaluated against a rubric. For SLO 5, students must also demonstrate safe laboratory practice, as observed by the instructor. This safety-related SLO has an achievement target of 100%. The achievement target for SLOs 1-4 is 90% of students will correctly answer 60% of the questions related to that outcome and for SLO 5, 6 is 90% of the students will achieve a score of 60% on the rubric. Results are:

SLO	Number of Students assessed	CHEM 210 Assessment	Target
1	15	100% success	Met
2	15	80% success	Not Met
3	15	80% success	Not Met
4	15	87% success	Not Met
5	15	100% and 93% success	Not Met
6	15	93% success	Met

During assessment of SLO 5 it was revealed that certain lab equipment must to be replaced in order to improve the safety of the classroom. Hot plates with exposed wires in the cords must be replaced. Additional high temperature thermometers must be acquired to measure the temperature of certain solutions which exceed the range of available thermometers. **Budget Amount Requested**: Heat/stir Plates $400 per unit, 12 units needed = $4,800 (HIGHEST PRIORITY, safety concern) and High temperature digital thermometers $55 each, 24 units needed total $1320.

Table 16. CHEM 220 has seven SLOs. SLOs 1-5 are assessed with an instructor-written test given at the start and end of the semester. Data from pre-tests indicate 0% success for SLOs 1-5. SLOs 6 and 7 are assessed from laboratory notebooks submitted on a weekly basis. The notebooks are evaluated against a rubric. For SLO 6, students must also demonstrate safe laboratory practice, as observed by the instructor. This safety-related SLO has an achievement target of 100%. The achievement target for SLOs 1-5 is 90% of students will correctly answer 60% of the questions related to that outcome and for SLO 6, 7 is 90% of the students will achieve a score of 60% on the rubric. Results are:

SLO	Number of Students assessed	CHEM 220 Assessment	Target
1	12	92% success	Met
2	12	50% success	Not Met
3	12	75% success	Not Met
4	12	100% success	Met
5	12	58% success	Not Met
6	12	100% and 92% success	Not Met
7	12	92% success	Met

The Spartan Pro software needed to improve CHEM 110 SLOs would also serve to improve SLOs 2 and 5 for this course. In addition, the instructor has requested specific software and visual media to enhance instruction related to SLO 5. **Budget Amount Requested:** $200.00

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

The chemistry department and its students utilize services of ITS, OSD, the Learning Center, the library, and the TAP/Honors program. Dialogue with these organizations is fruitful.

In the development of the science department safety policy, science department personnel discussed practices with health sciences, technical education, and facilities personnel. Each area has unique needs but a common emphasis on maintaining a safe working environment.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

In summer 2010, AVUHSD and AVC science teachers participated in a modeling instruction workshop. Title V paid for the program facilitator who was trained at the Arizona State University Modeling Instruction Center. This arrangement continues with monthly joint professional development in classroom implementation of modeling instruction techniques.

SOAR high school has adopted the CHEM 101 COR to provide students the opportunity to receive college credit for their equivalent high school work. Articulation with high schools was a goal proposed in the previous program review cycle. Similar agreements could be established with any high schools in which the course instructor meets the minimum qualifications required to teach CHEM 101 at AVC.

The AFRL continues to be a generous and unifying support for local STEM education efforts at all levels, K-16. Current collaborations involving AFRL and AVC include development of a program to administer resources from the National Defense Education Program (NDEP) and renewing an Educational Partnership Agreement (EPA).

An application has been started for a National Science Foundation's Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics at Two-Year Colleges (TUESTYC) grant. "Improving Conceptual Understanding in Undergraduate Chemistry Using the Constructivist Approach" would modify the articulated chemistry curriculum to utilize inquiry-based teaching. Instructors for CHEM 101, 110, and 120 have agreed to participate.

Individual instructors participate in outreach activities at schools or youth organizations when invited.

Area 9 Goals and Objectives (Updated annually)
List the goals and objectives the program has for the next four years.

Goal: Develop a community advisory board
Objectives: Ensure that the college is responsive to needs of the community. Inform the community of current college offerings. Open doors for students to have work/internship experiences with local employers.
Time Frame: Ongoing
Justification: The community and the college are integrally linked. Communication is the key to maximize mutual benefit for these parties and students.

Goal: Establish an AS in Chemistry Degree
Objective: Improve articulation of lower division coursework with bachelor's degree granting institutions.
Time Frame: 2011-2012
Justification: To support the implementation of SB1440, establishment of an AS in Chemistry will afford students the opportunity to transfer seamlessly to an institution that offers a bachelor's degree in chemistry.

Goal: Develop a Chemistry Technician Program
Objective: Establish a certificate program, which would be recognized by employers as excellent preparation for laboratory technicians
Time Frame: 3-5 years
Justification: To support community partners who need highly qualified laboratory technicians

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

An additional full-time chemistry faculty member is requested. Adjunct and overload hours account for 58% of the chemistry classes. Adjunct faculty teaches 69% of the CHEM 101 classes. Addition of a full-time faculty member would reduce the dependence on adjunct faculty and provide more flexibility in scheduling. This suggestion was made in the previous review when adjunct faculty taught only 40% of the chemistry classes. As enrollment continues to grow, the percentage of classes taught by adjunct instructors will also grow.

To provide adequate support for all laboratory instructors, it is necessary to hire a chemistry lab technician for nights and weekends. The biology program in spring 2011 will have 58 sections of 8 different classes supported by 2.5 lab technicians. The chemistry program with 26 sections of 6 different classes will have only one technician. There is at least one active chemistry lab for twelve hours of each day Monday through Thursday, nine hours on Friday and six hours on Saturday. Because the technician can work only 40 hours a week, several labs occur when no technician is available. While steps are taken to ensure that equipment and materials are available for every lab, frequently a need arises during class. With safety regulations requiring an instructor to stay with their class while it is in session, the instructor must choose to either jeopardize student learning by foregoing the needed supply or jeopardize safety by leaving the class to search for it. Both of these options are unacceptable to AVC, which places student success as its first priority and demands a safe, learning environment for all students. This unfortunate situation would be eliminated by hiring an additional lab technician.

When funding for them is available, student workers are a valuable resource. Their efforts are highly visible in terms of housekeeping and as help in set up and clean up of experiments. Additionally, students majoring in science benefit tremendously from the lab experience.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

The new Health and Sciences Building is scheduled to come online in July 2012. This may increase ability to schedule additional sections of courses. To meet the current laboratory needs and plan ahead for future demand, the chemistry faculty compiled this list of equipment. Faculty are looking for grant opportunities to purchase some of these necessities. This equipment is in addition to the needs highlighted in Section 6 to improve student success in learning outcomes.

High priorities (Most of these are already used in various labs. Additional equipment or replacement equipment is needed to provide an acceptable lab experience for the students.)

- Two Genesys 10S UV-Vis Spectrometers, $4900 each; total $9800 (Currently, 1 model

available for class of 24 students)

- Plumbing and gas cylinders to make donated gas chromatograph instrument operational. $3000 (This would make two GC instruments available. Currently, 24 students wait for a turn on the one operational GC.)

- Laboratory instruction is limited by availability of computers and Internet support. Many labs utilize instruments that record and analyze data graphically. Other activities require real-time Internet or rely on chemical modeling programs. There are no more than 8 computers available at a time. When two labs are scheduled to use computers at the same time, there may be 6 students per computer—not an optimal learning environment. Twelve laptops were requested in Section 6.

- pH meter $875 per unit. 12 units needed = $10,500 (There are currently only six functioning pH meters for a class of 24 students.)

Medium Priority—Equipment to outfit a lab for CHEM 205, Analytical Chemistry

- ICPAES (Inductively coupled plasma atomic emission spectrometer)

Applications: analysis of elements in soil and water, arsenic in food, trace elements bound to proteins, mineral analysis, and forensics. $50,000 to $110,000

- Mass Spectrometer $50,000 - $200,000

- Analytical Balances $1,205.00 per unit; 6 units needed $7,230.00

10.3 Identify funding needed to support student learning.

See Sections 6.4 and 10.2

Program Area: Engineering and Drafting

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

The program has seen positive growth and change despite the economic situation. The college's sole full-time engineering faculty retired at the end of 2009-2010 year and the district does not have plans at this time to fill the vacancy.

Table 17. Enrollment and Staffing Characteristics of Engineering and Drafting Courses 2006-2010.

	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**36**	**36.2**	**31**	**36.2**	**40**	**50.2**	**40**	**45.2**
*Year Total	77.2		72.2		95.2		90.2	
Enrollment	**130**	**118**	**123**	**119**	**165**	**165**	**175**	**156**
*Year Total	263		263		350		354	
FTEF	**2.4**	**2.4**	**2.1**	**2.4**	**2.7**	**3.3**	**2.7**	**3.0**
*Year Total	5.1		4.8		6.3		6.0	
FTES	**28.24**	**27.33**	**24.6**	**25.2**	**35.0**	**36.8**	**42**	**47.6**
*Year Total	81.3		76		100.2		94.9	

Drafting Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**10**	**8.7**	**5**	**8.7**	**10**	**13.7**	**10**	**8.7**
*Year Total	18.7		13.7		23.7		18.7	
Enrollment	28	26	14	20	29	32	26	29
*Year Total	54		34		61		55	
FTEF	**0.7**	**0.6**	**0.3**	**0.6**	**0.7**	**0.9**	**0.7**	**0.6**
*Year Total	1.2		0.9		1.6		1.2	
FTES	7.5	5.5	2.9	5.6	7.9	8.2	10.5	9.2
***Year Total**	19.7		14.4		24.9		19.7	

Engineering Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**26**	**27.5**	**26**	**27.5**	**30**	**36.5**	**30**	**36.5**
*Year Total	58.5		58.5		71.5		71.5	
Enrollment	**102**	**92**	**109**	**99**	**136**	**133**	**149**	**127**
*Year Total	209		229		289		299	
FTEF	**1.7**	**1.8**	**1.7**	**1.8**	**2**	**2.4**	**2**	**2.4**
*Year Total	3.9		3.9		4.8		4.8	
FTES	**20.8**	**21.8**	**21.7**	**19.6**	**27.1**	**28.6**	**31.6**	**38.4**

*Year Total	61.6	61.6	75.3	75.3

*Year Total includes summer before and intersession after the fall semester (e.g. summer 2006, fall 2006, intersession 2007 and spring 2007)

2.2 Briefly describe the program's activities and services in the past four years.

Table 17 shows the enrollment and staffing characteristics of the drafting/CAD and engineering courses from 2006-2010. Enrollments in drafting have stayed consistent ranging from 54 to 61 students while enrollments in engineering have increased from 209 to 299 students. The latter increase in engineering is largely due to the extensive high school outreach program developed in concert with the Engineering Program at the Lancaster University Center and funded through the Title V collaborative grant with CSU Fresno. Course offerings shown in Table 17 have ranged from 23 to 25 sections and meet the needs of certificate and transfer students. The retirement of the full-time engineering faculty member will yield a significant decrease in programmatic leadership.

Table 18. Number of Engineering and Drafting Sections Taught Summer 2006 to Spring 2010.

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007**	**2007-2008**	**2008-2009**	**2009-2010**
DRFT 125 Mechanical Drafting	1	1	1	1
DRFT 130 Architectural Drafting I	1	0	1	1
DRFT 150 Intermediate 2-D Autocad	2	2	2	2
DRFT 230 Architectural Drafting II	0	0	1	0
DRFT 240 Electronic Drafting	1	1	1	1
DRFT 250 Introduction to 3-D CAD Drafting	1	1	1	1
ENGR 110 Engineering Orientation	4	4	4	4
ENGR 115 Basic Engineering Drawing	4	4	4	4
ENGR120 Introduction to 2-D Autocad	4	4	4	4
ENGR130 Materials Science	1	1	1	1
ENGR130L Materials Science Lab	1	1	1	1
ENGR 185 Digital Logic and Design	0	1	1	1
ENGR 210 Statics	1	1	1	1
ENGR 210PS Statics Problem Solving Session	1	1	1	1
ENGR 230 Circuit Analysis	1	1	1	1
Totals	**23**	**23**	**25**	**24**

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

The CAD and engineering programs have been supported by Title V and VTEA funding. These funds were used to provide new workstations, plotters and printers plus updated AutoCAD licenses in APL 204A, B. MatLab software for use in the physics labs and the Digital Logic and Circuit Analysis engineering classes has been purchased through Title V. The materials laboratory has also been supported through the divisions EPA with the Air Force Research Laboratory.

Area 3 Curriculum (3.5 and 3.6 updated annually)

3.1 Identify degrees and certificates currently offered in the program.

Over the past four years, twelve certificates in Drafting/Computer Aided Design and ten associate degrees in Drafting/Computer Aided Design have been awarded. One Engineering Technology certificate, one Associate Degree in Engineering, and two Associate Degrees in Engineering Technology were also awarded.

The limited number of engineering degrees is a reflection of difficulty in articulating programs with bachelor's degree granting institutions. Because a bachelor's degree in engineering typically requires more courses and more prerequisites than other degrees, colleges and universities have very narrow guidelines for which classes can be transferred. Students at AVC opt to not take some of the classes required for the associate degree because they will not transfer and/or because there are other courses that they must complete before transferring. When the engineering major is examined in the future according to SB1440 principles, standardization should alleviate some of the current disparities. It is anticipated that degree awards would subsequently increase.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

The drafting CAD program continues to meet the needs of certificate students in this CTE discipline. In the absence of the leadership that a full-time faculty member would bring and largely influenced by the demands of the engineering program, Solidworks is being introduced to this program. The introduction of this 3D modeling software will also benefit the design component of the engineering program. Without the presentation of Dynamics and Strength of Materials, the engineering curriculum has met the needs of transfer engineering majors.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

Because adjunct faculty in this program is currently or recently employed in industry, they are

intimately familiar with the latest trends. The instructors advocate for their students to be trained in the latest programs for drafting and engineering. The division makes every effort to respond. Funding for new programs and upgrades has come from Title V, VTEA and the EPA with the Air Force Research Laboratory at Edwards AFB.

One of the adjunct engineering faculty participated in a week long modeling instruction workshop to learn more about effective teaching methods.

3.4 Recommend ways to improve completion of certificate major and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

Courses are scheduled in order to meet the certificate and transfer needs of students in the CAD and engineering programs. Drafting students tend to complete certificates while transfer engineering students complete only the courses needed for transfer rather than complete associate degrees. It is very apparent that each program would benefit from the presence of full-time faculty expertise and leadership.

3.5 Are all Course Outlines of Record (CORs) current?

All CORs for drafting and engineering courses are current.

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Faculty members match the Course Outline of Record (COR) with material in textbooks currently in use, section by section. When hired, faculty is provided with CORs of their assigned courses. Effort is made at division meetings, informal peer interaction, and faculty evaluations to communicate the importance of covering material as described in the COR.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

Many students entering the Drafting CAD program come to the program from area high schools through the auspices of articulation agreements. These students and others interested in the program are readily assisted by Student Counseling. The adjunct faculty members teaching this program are professionals in drafting/CAD and provide students with a current insight into the industry.

The drafting/CAD program has been adequately supported with the purchase of new computer work stations, printers and plotters, and AutoCAD and SolidWorks software. There is a need to have funding available for the annual upgrades of these programs.

Drafting/CAD students have some class time for the practice needed to develop their computing and drafting skills; however, there is a need for additional out-of-class opportunities to work on

their projects. There is a need to have the drafting software available to students in an open computer lab such as "The Prime Room", ME 100, to allow them access to the programs at their leisure.

Over the past 8 to 10 years through the activities of the Mathematics, Science, Engineering and Technology Consortium (MSET) and the Title V collaborative grant with CSU Fresno, an engineering pathway has been developed in area high and middle schools. Pre-engineering curricula has been introduced to high school and middle school students through Project Lead the Way and Gateway to Technology, respectively. Faculty outreach and a dedicated engineering counselor, has provided visibility for the college engineering program and guidance for students majoring in engineering and planning for transfer to complete their professional major.

4.2 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

With the retirement of our full-time drafting/CAD-engineering faculty member, it has become patently obvious that each program has a need for full-time professional insight and leadership. In the case of CAD, the program needs to convene a local advisory group and move toward the integration of GPS and GIS technologies into the curriculum. With the likelihood of CSU Long Beach bringing its' engineering program to the Lancaster University Center, it will be an asset to have a full-time instructor supporting the college's program.

The drafting/CAD program has suffered to some extent by the inability of the network/license server to consistently support the labs. This has resulted in the cancellation of classes. The division's computer technician, because of an access limitation, was not able to resolve these issues and discussions have addressed the possibility of the CAD classes running off of a local arena network (LAN).

Area 5 Data Analysis and Environmental Scan (Updated annually)

5.1 The program was provided with a substantial amount of data from the Office of Institutional Research and Planning. The self-study team should review and have a dialogue on the data and then identify major changes or enrollment trends expected to be of particular relevance to the program in the next four years. Consider FTES/WSCH data, success, retention and persistence as applicable, and the number of degrees and certificates, if applicable. Consider data on gender, age, ethnicity, night vs. day, etc.

a. Write about enrollment trends that the self-study team believes are important to the program's planning and resource needs. Why might these trends be occurring?

Other than for the 2007-08 academic year, enrollments in draft/CAD courses have remained fairly constant with an average 28 students (range 26-32). It is apparent that more males than female students are enrolled in drafting (70.7 to 27 percent) and of these students 48.4 percent are White Non-Hispanic while 32.8 percent are Hispanic. Fifty-two percent of the enrolled students are 24 years of age or younger and 28 percent at 40 or more years old.

Student retention in individual drafting/CAD courses ranged from 70.8 to 100 percent over the four academic years being considered (Table 19). On average, overall average rates of retention in these courses was 90.5 percent (range, 86.3-96.3).

Table 19. Average Student Retention in the Drafting and Engineering Courses 2006-2010.

Subject	Course		Academic	Year		Overall
	Number	2006-07	2007-08	2008-09	2009-10	
DRFT	125	81.8%	100.0%	100.0%	87.5%	92.3%
DRFT	130	81.3%		90.0%	93.3%	88.2%
DRFT	150	70.8%	88.9%	85.4%	100.0%	86.3%
DRFT	230			90.0%		90.0%
DRFT	240	100.0%	60.0%	100.0%	100.0%	90.0%
DRFT	250	92.3%	100.0%	92.9%	100.0%	96.3%
Average						90.5%
ENGR	110	90.3%	77.5%	83.2%	76.2%	81.8%
ENGR	115	91.6%	89.6%	93.1%	95.2%	92.4%
ENGR	120	94.0%	96.5%	89.5%	89.8%	92.5%
ENGR	130	85.7%	100.0%	56.3%	76.9%	79.7%
ENGR	130L	85.7%	100.0%	56.3%	75.0%	79.3%
ENGR	185		100.0%	78.6%	100.0%	92.9%
ENGR	199			100.0%	100.0%	100.0%
ENGR	210	100.0%	88.9%	88.2%	85.0%	90.5%
ENGR	210PS	100.0%	88.9%	87.5%	83.3%	89.9%
ENGR	220					
ENGR	220L					
ENGR	220PS					
ENGR	230	93.3%		85.0%	95.7%	91.3%
Average						89.0%

Retention in individual engineering courses ranged from 56.3 to 100 percent over the four academic years being considered (Table 19). On average, overall average rates of retention in these courses were 89.0 percent (range, 79.3- 100). Strengths of Material (ENGR 220, PS and L) were not taught during this time period and is being considered for a declaration of obsolescence. With respect to most colleges and universities ENGR 220 is considered an upper division course; however, the California Polytechnic Universities consider the course lower division. Based on the transfer intentions of the students it is difficult to schedule the course and enroll a full class.

Student success in individual drafting/CAD courses ranged from 50.5 to 100 percent over the four academic years being considered (Table 20). On average, overall average rates of success in these courses was 79.9 percent (range, 69.0-94.).

Table 20. Average Student Success in the Drafting and Engineering Courses 2006-2010.

Subject	Course		Academic	Year		Overall
	Number	2006-07	2007-08	2008-09	2009-10	
DRFT	125	63.6%	75.0%	62.5%	75.0%	69.0%
DRFT	130	68.8%		75.0%	73.3%	72.4%
DRFT	150	50.0%	79.2%	75.3%	73.9%	69.6%
DRFT	230			90.0%		90.0%
DRFT	240	100.0%	60.0%		91.7%	83.9%
DRFT	250	84.6%	100.0%	92.9%	100.0%	94.4%
Average						79.9%
ENGR	110	70.9%	55.2%	69.4%	55.3%	62.7%
ENGR	115	63.5%	67.5%	72.3%	64.0%	66.8%
ENGR	120	70.9%	78.1%	68.7%	73.2%	72.7%
ENGR	130	85.7%	100.0%	50.0%	76.9%	78.2%
ENGR	130L	85.7%	100.0%	56.3%	75.0%	79.3%
ENGR	185		100.0%	64.3%	100.0%	88.1%
ENGR	199			100.0%	100.0%	100.0%
ENGR	210	93.3%	88.9%	82.4%	65.0%	82.4%
ENGR	210PS	93.3%	88.9%	81.3%	55.6%	79.8%
ENGR	220					
ENGR	220L					
ENGR	220PS					
ENGR	230	86.7%		70.0%	95.7%	84.1%
Average						79.4%

Student success in individual engineering courses ranged from 50.0 to 100 percent over the four academic years being considered (Table 20). On average, overall average rates of success in these courses were 79.4 percent (range, 62.7- 100).

A total of 15 certificates and 2 degrees were awarded in the Draft/CAD and Engineering programs, respectively (Table 5). Although a significantly greater number of students declare engineering as their major than receive the Associates Degree, it should be noted that transfer to a degree program at a major university or college does not require the associate's degree.

b. Considering these trends, how well is the program doing in meeting the needs of the various learner populations attending the college?

The drafting/CAD program continues to meet the needs of various learner populations attending the college. High school students via articulated courses with local high school ROP and Project Lead the Way programs have found the college program an avenue to certification in CAD. In several recent instances, draftsmen from local and regional industries have come to the college to complete the Certificate in drafting. These latter situations have enabled the individual to retain there current employment. The drafting/CAD program also supports the design requirement of the transfer engineering curriculum It has become apparent that students in technical theater, interior design and horticulture- landscaping could benefit from a course in drafting/CAD.

Enrollment in the engineering program has increased over the past years in part as a function of AVC's participation in the MSET Consortium, a consortium of educational organizations and public and private industries, and the development of the CSU Fresno Engineering at the Lancaster University Center. The pre-engineering Project Lead the Way curriculum has been introduced into four area high schools and several courses have been articulated to facilitate continuation of the students engineering education at AVC. Through grant funds, a STEM pathway has been developed throughout the educational institutions in the greater Antelope Valley. To accommodate the educational needs of engineering students who work full-time in the local aerospace industry, sections of classes are scheduled late in the afternoon or evening.

5.2 Report on the progress of recommendations and accomplishment of goals identified in the program's last program review. Reflect on the strengths, weaknesses, and improvements of the program. Clearly state the performance/quality indicators used by the program.

As part of reorganization in Academic Affairs, the drafting/CAD and engineering programs were added to the Mathematics and Science Division in 2008. These programs were not included in the previous divisional program review and prior reviews for Technical education were not received.

Area 6 Student and Program Learning Outcomes (PLO) Assessment (Updated annually)

6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

Student Learning Outcomes were developed for all drafting and engineering courses before the retirement of the full-time instructor in this subject area. Assessment for some of those courses occurred in the 2009-2010 cycle.

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Via email, faculty professional development activities, division and department meetings, instructors are encouraged to complete SLO assessment.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

The goal for the next four years is to have 100% compliance for SLO reporting.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

As evident from the results reported below for the 2009-2010 cycle (Tables 21-25), students are meeting the SLOs for the courses that were assessed. A replacement full-time faculty to oversee the drafting and engineering program, including SLOs, would facilitate assessment, analysis and utilization of data gained from assessment.

Table 21. DRFT 125 has three SLOs. The achievement target for SLOs 1-3 is for 90% of students to correctly answer 60% of questions pertaining to that SLO. Assessment was made by analysis of results from a standardized final developed by the faculty. Results are as follows:

SLO	Number of Students assessed	DRFT 125 Assessment	Target
1	10	90% success	Met
2	10	90% success	Met
3	10	90% success	Met

Table 22. DRFT 150 has three SLOs. The achievement target for SLOs 1-3 is for 90% of students to correctly answer 60% of questions pertaining to that SLO. Assessment was made by analysis of results from a standardized final developed by the faculty. Results are as follows:

SLO	Number of Students assessed	DRFT 150 Assessment	Target
1	8	88% success	~Met
2	8	88% success	~Met
3	8	88% success	~Met

Due to small sample size, if 100% of students did not succeed, there is not way to meet the target. With only one student not succeeding, or 88%, the target has been adequately approached.

Table 23. ENGR 115 has three SLOs. The achievement target is for 70% of students to correctly answer 70% of the questions pertaining to that SLO on a final exam. Results are as follows:

SLO	Number of Students assessed	ENGR 115 Assessment	Target
1	42	76% success	Met

2	42	76% success	Met
3	42	76% success	Met

Table 24. ENGR 120 For the three SLOs, 70% of students taking final exam should score greater or equal to 59%. Results are as follows:

SLO	Number of Students assessed	ENGR 120 Assessment	Target
1	12	75% success	Met
2	12	75% success	Met
3	12	75% success	Met

Table 25. ENGR 210 has six SLOs. 70% of students scoring 50% on final exam results are as follows:

SLO	Number of Students assessed	ENGR 210 Assessment	Target
1	18	56% success	Met
2	18	56% success	Met
3	18	56% success	Met

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

Counseling has provided excellent guidance for students in drafting CAD program. Title V has provided a dedicated counselor for students majoring in engineering and outreach. A STEM pathway from middle school to AVC has been established in our community with tha assiatnace of federal grant monies and the MSET Consortium.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

A Memorandum of Understanding with the TYBRIN Corporation, a contractor at NASA Dryden Flight Research Center, has established semester internships for sophomore engineering students. Students enroll in ENGR 199 Engineering Occupational Work Experience to participate. All involved parties are extremely pleased with the results of this mutually beneficial activity.

The engineering program works closely with the College of Engineering, CSU Fresno, Antelope Valley Engineering Program at the Lancaster University Center. Because of significant decreases in state funding, the university will be withdrawing from the program in spring 2011. The engineering department has joined with a community consortium composed of Northrop Grumman, AFRL and AFFTC Edwards AFB, MSET, AV Board of Trade, GAVEA, City of Lancaster, China Lake Naval Weapons Test Center, and Cerro Coso College to recruit CSU

Long Beach, College of Engineering to the LUC.

Area 9 Goals and Objectives (Updated annually)
List the goals and objectives the program has for the next four years.

Goal 1: Convene an active community advisory board for the drafting/CAD program.
Objectives: Ensure that the drafting/CAD program is responsive to needs of the profession and the community. Inform the community of current college offerings. Provide opportunities for students to have work/internship experiences with local employers.
Time Frame: One year-annual meetings, at the least.
Justification: The local aerospace and other community/regional industries require the skills provided by the drafting/CAD program and the college must be responsive to their requirements. Communication is the key to maximize mutual benefit for these parties and students.

Goal 2: Review the current engineering curriculum to more closely align it with transfer institutions and CSU Long Beach.
Objective: Improve articulation of lower division coursework with bachelor's degree granting institutions.
Time Frame: 2011-2012
Justification: Transfer to college and university programs now requires knowledge of Matlab and Solid Works. These programs must be incorporated into our current curriculum and students must carry these skills and knowledge into their junior year.

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

In drafting CAD, 100% of classes are taught by adjunct instructors. Prior to Fall 2010, 47% of engineering classes were taught by adjunct faculty members. There is a significant need for full-time faculty leadership in this program. A highly qualified full-time CAD instructor would take the program into the future with consideration of the use of geographic information services (GIS) and global positioning satellite systems (GPS) in surveying and other areas of civil engineering. As well, CAD for interior design and technical theatre should be introduced.

The engineering major that transfers students into ABET accredited professional engineering

programs across the state and nation is a professional program. It is therefore imperative to have a full-time engineering faculty member provide leadership for this growing program.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

1. Four new pc workstations in the Engineering Materials Laboratory.
2. Two metallurgical microscopes with digital video capabilities and a wide screen monitor for viewing of materials samples.
3. Funds available to assure upgrades of software and hardware used in both instructional programs.
4. The drafting/cad program needs access to a more reliable computer network and license server. Far to often, classes are cancelled because the computers in the CAD classrooms, APL 204 A,B, are unable to access the license server. It has become very evident that success of the program will rely upon the creation of a local area network (LAN) to support instruction and the availability of the divisional computer technician to support its operation. At present ITS limits the divisional computer technician access to network operations.

Program Area: Geosciences

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

The college's sole full time geography faculty retired at the end of the Spring 2008 semester and the position was filled for Fall 2008.

Table 26 shows positive growth in all geoscience classes until budget cuts in 2009-2010. The Geographic Information Systems (GIS) program has been dramatically affected by the economic crisis. GIS courses have historically suffered from low enrollment, but have filled anyway since they are part of a certificate program. With few job prospects for certificate holders since 2009, GEOG 220, 221, and 222 have not had enough students to run as a normal class. Students on track for the certificate had to take the courses as independent study. This meant less faculty interaction, which affected student success. No GIS certificates were awarded in 2009-2010.

Table 26. Enrollment and Staffing Characteristic for Earth Science, Geography, and Geology Courses 2006-2010.

Combined	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE	**67.5**	**77.5**	**75.7**	**82**	**88**	**85.5**	**89**	**71.5**
*Year Total	168		175		196		174.5	
Enrollment	**613**	**602**	**573**	**668**	**760**	**779**	**899**	**647**
*Year Total	1367		1370		1719		1648	
FTEF	**4.5**	**5.2**	**5**	**5.5**	**5.9**	**5.7**	**5.9**	**4.8**
*Year Total	11.2		11.7		13		11.6	
FTES	**78.2**	**77.2**	**80.4**	**85.4**	**102**	**96.9**	**93.7**	**75.3**
*Year Total	177.9		184.2		206.3		183.7	

*Year Total includes summer before and intersession after the fall semester (e.g. summer 2006, fall 2006, intersession 2007 and spring 2007).

Earth Science Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE					**6**	**6**	**6**	**6**
*Year Total					12		12	
Enrollment					**17**	**18**	**25**	**24**
*Year Total					35		49	
FTEF					**0.4**	**0.4**	**0.4**	**0.4**
*Year Total					0.8		0.8	
FTES					**6.3**	**6.3**	**6.3**	**6.3**
*Year Total					12.6		12.6	

Geography Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**48.5**	**63**	**58**	**61**	**60**	**52.5**	**60**	**46.5**
*Year Total	134.5		136.5		135		120.5	
Enrollment	**417**	**442**	**418**	**481**	**513**	**511**	**611**	**445**
*Year Total	1011		1028		1204		1158	
FTEF	**3.2**	**4.2**	**3.9**	**4.1**	**4**	**3.5**	**4**	**3.1**
*Year Total	9.0		9.1		9		8	
FTES	**51.8**	**56.4**	**61.3**	**58.1**	**69.0**	**59.8**	**63.2**	**49.0**
***Year Total**	141.6		143.7		142		126.8	

Geology Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**19**	**14.5**	**17.5**	**21**	**22**	**27**	**23**	**19**
*Year Total	33.5		38.5		49		42	
Enrollment	**196**	**160**	**155**	**187**	**230**	**250**	**263**	**178**
*Year Total	356		342		480		441	
FTEF	**1.3**	**1.0**	**1.2**	**1.4**	**1.5**	**1.8**	**1.5**	**1.3**
*Year Total	2.2		2.6		3.3		2.8	
FTES	**26.3**	**20.8**	**19.2**	**27.3**	**29.5**	**33.4**	**24.2**	**20**
*Year Total	35.3		40.5		51.6		44.2	

*Year Total includes summer before and intersession after the fall semester (e.g. summer 2006, fall 2006, intersession 2007 and spring 2007).

2.2 Briefly describe the program's activities and services in the past four years.

The geosciences program at Antelope Valley College provides students with an understanding of the Earth, and how it's internal and external physical processes shape the surface of the Earth. It explores the spatial relationships between the natural environment and human societies and examines how each impacts and influences the other.

The program has continued to grow within the last four years. In addition to the transferable courses offered, an integrated lecture/lab Earth Science course was developed, designed mainly for students working toward teaching credentials in the CSUs. More courses are being developed to meet the college's mission and ILOs.

Geosciences faculty also have given a number of Professional Development (Flex) presentations on geology and geography subject matter.

Table 27. Number of Geoscience Sections Taught from Summer 2006 to Spring 2010

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007**	**2007-2008**	**2008-2009**	**2009-2010**
ERSC 101 Earth Science/Earth Science Lab.			2	2
GEOG 101 Physical Geography	11	14	14	12
GEOG 101L Physical Geography Lab.	9	8	10	8
GEOG 102 Weather and Climate	3	4	4	3
GEOG 102L Weather and Climate Lab.	2	2	2	1
GEOG 105 Cultural Geography	9	9	9	9
GEOG 106 California Geography	1	0	0	0
GEOG 201 Map Interpretation	3	2	2	2
GEOG 205 Intro. Geographic Info. Systems	3	3	1	2
GEOG 220 Data Acquisition & Mgmt. GIS	1	1	0	0
GEOG 221 Spatial Analysis in GIS	0	1	1	1
GEOG 222 Cartography for GIS	1	1	0	0
GEOG 298A,B,C Spec. Studies in GIS	2	2	1	2
GEOG 299 Special Topics: Field Geography	1	0	0	0
GEOL 101 Physical Geology	6	8	9	8
GEOL 101L Physical Geology Lab.	4	5	6	5
GEOL 102 Historical Geology	1	0	1	1
Totals	**57**	**60**	**62**	**56**

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

In 2009, the program received $1,000 from the Antelope Valley College Foundation for purchase of a class set of declinated sighting compasses. The compasses have been incorporated into lab activities in several geosciences classes to give students hands-on experience with a professional level geographic tool. In 2010, the program was also awarded $965 from the AVC Foundation for updating topographic maps used in the Geography and Geology labs.

Funding from a Title V grant was also used in 2009 to purchase new computers and printers for the GIS lab.

Area 3 Curriculum (3.5 and 3.6 updated annually)
3.1 Identify degrees and certificates currently offered in the program.

Currently the program only offers the GIS certificate. An additional AA degree in geography is being developed and several geosciences courses will be incorporated into a planned Associates degree in environmental sciences. A number of the courses fulfill science and science lab requirements for many Bachelor degrees offered at four-year colleges and universities. The AS in Physical Sciences requires GEOG 101 with lab and GEOL 101 with lab or GEOL 102.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

All of the courses offered in the geosciences program are foundational/introductory courses transferable to California State University, University of California, and other four-year institutes. Since the last Program Review, a combined lecture-lab Earth Science course has been added to the geosciences curriculum. This was developed and implemented to provide a required course for transfer students seeking a teaching credential through the local California State University that was no longer being offered by that four-year institute.

The broad range of subject matter in the current geoscience courses, from studying diversity in cultural geography, gaining transferable education in physical geology and geography, and learning employment skills in GIS and earth science courses, rises to the mission and meets the ILOs. A change to prerequisites for the Physical Geography Lab was submitted to make the course fulfill Area 5 of the IGETC. Additionally, new courses in World Regional Geography, California Geology, and Field Geology are currently being developed to introduce students to additional subjects within Geosciences.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

Geosciences faculty maintain affiliations with professional associations in order to stay current with trends in their disciplines. The Geosciences are constantly evolving as new research is conducted and new technology is developed. GIS is one subject that requires constant monitoring of the latest software to ensure students get the training they need. All of the program courses are transferable to CSU and UC. No basic skill or non-credit courses are taught. It is problematic that many students lack the appropriate English and Math proficiency to succeed in the Geoscience courses.

As soon as funding is once again available, Geosciences faculty should be allowed to attend conferences to ensure they remain up to date in both subject matter and pedagogy.

3.4 Recommend ways to improve completion of certificate major and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

Students have opportunities each semester to take a variety of Geosciences courses. The

program has difficulty getting enough students to fill GEOG 220, 221, and 222. These courses have a prerequisite of Geography 205, Introduction to GIS. Geography 205 has had a low success rate, (averaging 54% from Fall 2007 to Fall 2010), but showed improvement to 76% in Spring 2010. Sadly, even with a 100% success rate and all of those students enrolling in Geography 220 the following semester, Geography 220 wouldn't have enough students to fill up to 80% of the class maximum. More student awareness of this program is needed.

As mentioned in the 2007-08 program review, funding release time to allow faculty to promote and enhance the Geosciences program is much needed. Countless reports on the growth of geosciences industries like geophysics, GIS, and remote sensing show that a need exists for a skilled workforce, but communicating this to students has been difficult. The one fulltime geography instructor is responsible for the above in addition to teaching, assessing, and updating seven geography courses and five GIS courses. Such a diverse schedule requires a tremendous amount of prep time for five or six separate courses each semester. Alternatively, hiring another fulltime faculty member to have one dedicated to GIS and one dedicated to geography would help. Adjunct faculty do a wonderful job of teaching in the classroom, but aren't paid to nor expected to generate community interest, conduct student outreach, and dialogue with the counseling staff to ensure they are fully aware of the program.

3.5 Are all Course Outlines of Record (CORs) current?

All CORs for are current. Several were revised since the last program review.

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Geoscience faculty recognizes the importance of utilizing CORs when designing course syllabi, which are submitted to the Division office each semester. The importance of including the CORs in syllabi has been a subject of professional development (FLEX) presentations. It is also part of the faculty evaluation process. Evaluators look at the incorporation of CORs into syllabi and lectures or lab activities. Steps are underway to ensure that the evaluation of tenured faculty occurs regularly.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

Technology issues have continued to plague the program, specifically in the GIS courses. Students signing up for these courses have diverse backgrounds in computer technology and many are not prepared to handle technical glitches when they arise. Students who are already struggling with GIS software get bogged down in technology minutiae.

For example, the drive letter to access the GIS data and exercises was changed from "S:\" to "I:\". This might not seem like a big change, but the GIS software works by pointing to data on the server, which means drive letters must remain consistent. Students open empty map files and get frustrated. All of the files have not yet been fixed and instructor time is often spent fixing

this. Students have to wait while individual computers are fixed, which means the pacing of the course is slowed, and many students lose interest.

A fix to this could be to maintain one copy of files in a read-only folder. Students could work from this and any errors could be fixed once and then applied to all student computers. The problem is that students have the ability to save and change files in all areas of the GIS server. This means all of our data files can be destroyed if a student hits the wrong button. Repeated requests have been sent to ITS to fix the access for students, but no fix has occurred. In order to protect original data, redundant copies must be repeatedly copied for student use, which wastes both faculty time and disc space.

4.1 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

The program received new computer hardware since the 2007-08 program review, which has improved the quality of instruction. Computers work faster and can handle modern GIS data (e.g. satellite photos, digital elevation models). Unfortunately, there is still a plethora of issues with software and servers.

The main problem has been a lack of communication from ITS, either in responding to Help Desk requests or alerting faculty to technology changes. The expensive wide format printer we received with the Title V grant money has not been used once in the three semesters we have had it. The proper driver has not been installed on the server, which means we don't have a computer that can send prints to the printer. This particular printer is an industry standard in GIS and knowledge of its operation would greatly benefit Geosciences students. Requests to fix it have been sent repeatedly to ITS, but neither a fix nor an answer to why it can't be fixed has occurred.

Area 5 Data Analysis and Environmental Scan (Updated annually)

5.1 The program was provided with a substantial amount of data from the Office of Institutional Research and Planning. The self-study team should review and have a dialogue on the data and then identify major changes or enrollment trends expected to be of particular relevance to the program in the next four years. Consider WSCH/FTES, success, retention and persistence as applicable, and the number of degrees and certificates, if applicable. Consider data on gender, age, ethnicity, night vs. day, etc.

- **b. Write about enrollment trends that the self-study team believes are important to the program's planning and resource needs. Why might these trends be occurring?**
- **c. Considering these trends, how well is the program doing in meeting the needs of the various learner populations attending the college?**

Overall enrollment of students taking Geoscience courses has increased from 1240 in the 2005-2006 academic year to 1546 for the 2009-2010 academic year, while the number of course offerings has remained essentially the same (52 versus 53). This most likely reflects the general increase in student population at AVC over that same time period, along with the increased number of courses that have been cut due to budgetary issues over the past several years. Enrollment figures reveal that a total of 6104 students enrolled in a total of 117 Geoscience courses between summer 2006 and spring 2010.

Fifty-six percent of those students were female, 43% were male, while less than 1% did not state their gender. Of the 6104 students enrolled since summer 2006, 38% identified themselves as being White Non-Hispanic, 30% Hispanic, 16% Black Non-Hispanic, 4.5% Asian or Pacific Islander, 1.3% American Indian or unreported, and 14% as other. The student enrollment data shows that 72% of geoscience students were 24 years of age or younger, while 28% were 25 years or older.

Student retention and success rates have been variable in the past, and that trend continues. Overall the 117 geoscience courses taught between summer 2006 to spring 2010 had an 89% average retention rate with a range of 40% to 100%. The average success rate for those geoscience courses is 70.5% with a range of 23% to 100%. It appears that 200-level courses have consistently higher retention and success rates (with the exception of GEOG 205) than 100-level courses. This may be related to the fact that students taking 200-level classes are either on track to transfer to a 4-year college, or working towards the GIS certificate program and need those courses for their degree or certificate. Over the past five academic years, ten certificates in GIS have been awarded (Table 5). This amounts to 38.5 percent of the certificates awarded in the division. As discussed in Section 4.1, student success in GEOG 205 is impacted by technical issues.

From summer 2006 through Spring 2010, geoscience courses have accounted for 63.6 FTEF. Only 30% of this is from regular full time faculty. Adjunct and overload account for a full 70% of this amount of teaching. This underscores the need for an additional full time instructor to be hired in this area.

5.2 Report on the progress of recommendations and accomplishment of goals identified in the program's last program review. Reflect on the strengths, weaknesses, and improvements of the program. Clearly state the performance/quality indicators used by the program.

No specific short-term goals were identified for Geosciences in the last program review. However, one division-level goal that involved the program was development of a department chair structure. The Division now has department chairs for Math and Science, with geosciences in the oversight of the Science Chair. A full-time Geography faculty retired since the last program review. A replacement was hired immediately resulting in no change in the number of full-time faculty. Currently, there are no adjunct faculty teaching Geology or Earth Science.

The GIS program is still struggling with inadequate support from ITS. Funding obtained for new GIS workstations was redirected by ITS to the purchase of blades which could not be used with the industry standard GIS software used for the GIS certificate. Student dissatisfaction with ongoing computer problems, has contributed to low enrollment.

Area 6 Student and Program Learning Outcomes Assessment (Updated annually)
6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

SLOs were developed for all courses and most have been assessed in multiple sections of each course. The development of PLOs for the GIS certificate program will be a priority in the near future, keeping in line with PLO development of other degree and certificate programs at AVC.

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Fulltime faculty have spearheaded assessment and collection of SLOs. Adjuncts are encouraged to suggest their own test questions or other methods of evaluation in order to make the process relevant to them.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

SLOs will continue to be measured each semester. SLO assessment is still in its infancy and the program is trying to find the best ways to actually measure student comprehension as well as how to correct any pedagogical deficiencies that affect student learning.

PLOs for the GIS certificate are still being developed, with expected completion by the end of spring 2011.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

Most geosciences courses have had SLOs assessed. The advanced GIS courses (GEOG 220, 221, 222, and 298) have not because classes have been cancelled due to low enrollment. The geology and earth sciences data have been measured, but are currently being processed to be entered into WEAVE. The assessed SLOs for geosciences courses are listed below. Data is from the 2009-2010 assessment cycle (Tables 28-32).

Table 28. GEOG 101 has six SLOs. The achievement target for each of the SLOs is for 70% of students to correctly answer a set of standardized exam questions. Results of the assessment are:

SLO	Number of Students assessed	GEOG 101 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2	87	58% success	Not Met
3	87	72% success	Met
4	87	41% success	Not Met
5	87	Not assessed yet	Met
6	167	65% success	Not Met

The GEOG 101 courses have just switched to a new textbook that incorporates a more visual approach to understanding the material. We have yet to assess SLO data from these new methods, but are curious to see if this generates improvement in SLO success.

Table 29. GEOG 101L has four SLOs. The achievement target for each of the SLOs is for 70% of students earn a score of 70% or higher on the lab activities. Results of the assessment are:

SLO	Number of Students assessed	GEOG 101L Assessment	Target
1	16	87% success	Met
2	16	88% success	Met
3	16	87% success	Met
4	11	88% success	Met

While it appears that GEOG 101L is highly successful, we are concerned that our methods of assessment are not rigorous enough to truly determine student understanding of the material. The lab activities are currently being revised to ensure they are challenging to the students and pre-lab quizzes will be used to better assess student learning.

Table 30. GEOG 105 has six SLOs. The achievement target for each of the SLOs is for 70% of students to correctly answer a set of standardized exam questions. Results of the assessment are:

SLO	Number of Students assessed	GEOG 105 Assessment	Target
1	31	50% success	Not Met
2	28	82% success	Met
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	
6	78	79% success	Met

Coordinating standardized test questions in a subject that lends itself to different teaching methods has proved challenging. It is currently a priority to construct useful means of measuring SLOs 3, 4, & 5 across all of our GEOG 105 sections.

Table 31. GEOG 201 has five SLOs. The achievement target for each of the SLOs is for 70% success rate on projects and tests. Results of the assessment are:

SLO	Number of Students assessed	GEOG 201 Assessment	Target
1	18	94% success	Met
2	18	72% success	Met
3	18	65% success	Not Met
4	18	72% success	Met
5	17	56% success	Not Met

The main barrier for students succeeding in this class is the lack of GPS receiver units for them to use in class and during field trips**.** It is our request to fund a class set of GPS units that can be used by students in this class and other technique classes (101L, 220). Budget amount requested: $5,000.00.

Table 32. GEOG 205 has five SLOs. The achievement target for each of the SLOs is for 70% success rate on projects and tests. Results of the assessment are:

SLO	Number of Students assessed	GEOG 205 Assessment	Target

1		Not assessed in 2009-2010 cycle	
2	25	82% success	Met
3	24	68% success	Not Met
4	24	68% success	Not Met
5	24	68% success	Not Met

Students are close to success, but many run into trouble when it is time for them to work on their independent final project. Without access to the GIS software either at home or in a computer lab outside of class time, many students struggle to successfully complete their GIS analysis. It is our request to fund at least two computers in an existing computer lab, such as ME 100 The Prime Room, that are dedicated to running the ArcGIS software. These computers would enable students to work on course assignments at times other than scheduled class time.

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

Geosciences faculty have volunteered time to work with Student Services in demonstrating GIS to middle school students visiting the schools. Additionally, GIS work was conducted for Administration in determining which students actually live in National Forest boundaries, thus making AVC eligible for additional funding.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

Currently Geosciences faculty have been maintaining links with departments at neighboring four year universities to ensure AVC students are prepared to transfer. The Earth Science course offered by AVC is a direct result of cooperative interaction between AVC and CSU Bakersfield.

Faculty use lectures to current students to demonstrate and generate interest in other Geosciences classes (e.g. using a Geography 101 lecture on volcanoes to show the applications of GIS technology). A webpage for the program's GIS certificate has been linked to the Antelope Valley College website, though there has been little time to fully develop the page. The hope is that it will make its way into Google search results for potentially interested students in the area. Other than such a passive method, faculty commitments to teaching classes and college governance have made it difficult to generate outside interest in the program.

The Geosciences faculty members are also working together with other science faculty to develop an Environmental Science Program that will merge different science disciplines. It is anticipated that this will include cooperative outreach to the community including local water districts, environmental companies, and Edwards Air Force base.

Area 9 Goals and Objectives (Updated annually)
List the goals and objectives the program has for the next four years.

Goal 1: Rebuild the GIS Certificate Advisory Committee
Objective: To ensure the courses that count toward the GIS certificate give students training that is relevant to public and private sector jobs.
Time frame: By Spring 2011
Justification: This is a crucial component to meeting our program's mission and the college's, as well as ILOs 2 and 6.

Goal 2: Create a new World Regional Geography class.
Objectives: Write the COR; submit it to AP&P for review; once approved, get the course on the schedule.
Time Frame: Have the course on the Fall 2013 schedule.
Justification: This goal supports ILOs 3 and 5 and would provide a transferable course that is necessary for most Bachelors' degrees in Geography.

Goal 3: Create an Associates Degree in Geography.
Objectives: Improve articulation of lower division coursework with bachelor's degree granting institutions.
Time Frame: Have the degree in the 2014-15 catalog.
Justification: This goal supports the college's mission to provide a "quality, comprehensive education" and would offer another degree option to students interested in Geosciences.

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

A new full time faculty position in Geography or GIS is required. As noted in section 5.1, adjunct and instructor overload account for 70% of the teaching in the geosciences area. This demonstrates strong need for an additional full time instructor. Additionally, as discussed in section 3.4, another full time instructor is essential to help shoulder responsibilities associated with the GIS program. In the absence of funded release time, this position would help current Geosciences faculty better develop and expand the GIS certificate and attract more students.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to

provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

The new Health and Sciences building should help ensure facilities are both safe and comfortable for students and faculty. The program will need to secure money to update equipment for the new building. Currently the Geography/Geology lab has a diminished supply of equipment while lab classes taught at the Palmdale Center have no permanent equipment. Items needed are:

- Globes for Palmdale Lab
- Compasses for Palmdale Lab
- Class sets of GPS receivers, one for each lab
- New class sets of topographic maps for both labs
- 100ft/30m tape measure for Palmdale Lab
- SPSS software for Geography 221: Spatial Analysis in GIS
- Adobe Creative Suite software for Geography 222: Cartography in GIS
- 2 Stream Tables (for simulating river geomorphology), 1 for each lab
- 6 Munsell Soil Color Charts, 3 for each lab

10.3 Identify funding needed to support student learning.

Grant funding will be pursued to purchase the above items.

Program Area: Physical Sciences (Astronomy, Physics, Physical Science)

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

Starting in fall 2009, a prerequisite of MATH 102 was instituted for ASTR 101 in order for the course to satisfy Area 5 of the IGETC program. Starting in 2009, the astronomy program saw a drop in enrollment of approximately 33% due in part to this prerequisite and compounded by budget cuts.

Since the last program review, General Physics PHYS 210, 210L, and 210PS were combined and renamed as General Physics PHYS 211, although the course content was not changed.

In spring 2005 the Physical Science (PSCI 101) curriculum was changed from the classical lecture/lab type to an inquiry based, hands-on curriculum. The inquiry-based method of teaching adopted has been supported by NSF for over 30 years. As a result of this new curriculum, all on-line PSCI classes have been eliminated. There was no justification for an online class, when the curriculum emphasizes labs and experiments that need to be performed on campus.

Table 33. Enrollment and Staffing Characteristics of Astronomy, Physics, and Physical Science Courses 2006-2010.

Combined	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE	**95.5**	**110.5**	**111.5**	**102.5**	**101.1**	**105.4**	**86**	**80.5**
*Year Total	246.5		278.5		259		201.5	
Enrollment	492	467	496	457	541	534	382	336
*Year Total	1131		1167		1251		843	
FTEF	**6.7**	**7.4**	**7.4**	**6.8**	**6.7**	**7.0**	**5.7**	**5.4**
*Year Total	16.4		18.6		17.3		13.4	
FTES	**90.7**	**116.3**	**117.4**	**107.9**	**106.4**	**110.9**	**90.5**	**84.7**
*Year Total	259.5		293.5		272.6		212.1	

*Year total includes summer before and intersession after the fall semester (e.g. Total is summer 2006, fall 2006, intersession 2007 and spring 2007).

Astronomy Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE	**40**	**41.5**	**37**	**36.5**	**38.5**	**38.5**	**23**	**22.5**
*Year Total	98		90		93.5		56.5	
Enrollment	**284**	**270**	**263**	**233**	**304**	**310**	**169**	**134**
*Year Total	647		583		702		361	
FTEF	**2.7**	**2.7**	**2.5**	**2.4**	**2.6**	**2.6**	**1.5**	**1.5**
*Year Total	6.5		6		6.2		3.8	
FTES	**38.9**	**38.1**	**37.0**	**34.3**	**39.8**	**42.6**	**24.2**	**23.7**

*Year Total	103.2	94.7	98.4	59.5

Physics Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE	**22.5**	**33**	**38.5**	**33**	**32.6**	**33**	**33**	**40**
*Year Total	61.5		83.5		77.6		85	
Enrollment	**96**	**109**	**113**	**112**	**128**	**116**	**119**	**136**
*Year Total	229		255		270		290	
FTEF	**1.9**	**3.4**	**3.8**	**4**	**3.8**	**3.7**	**3**	**3.1**
*Year Total	6.1		9.4		9.4		7.3	
FTES	**23.5**	**24.2**	**26.8**	**25.7**	**29.2**	**27.6**	**34.7**	**42.1**
*Year Total	64.7		87.9		81.7		89	

Physical Science Only	2006-2007		2007-2008		2008-2009		2009-2010	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
LHE	**33**	**36**	**36**	**33**	**30**	**33.9**	**30**	**18**
*Year Total	87		105		87.9		60	
Enrollment	**112**	**88**	**120**	**112**	**109**	**108**	**94**	**66**
*Year Total	255		329		279		192	
FTEF	**1.8**	**1.2**	**1.2**	**0.4**	**0.4**	**0.8**	**1.2**	**0.8**
*Year Total	3.8		3.2		1.6		2.4	
FTES	**29.1**	**23.4**	**26.1**	**25.3**	**24.0**	**23.0**	**31.6**	**18.9**
*Year Total	92.6		110.5		92.5		63.2	

*Year total includes summer before and intersession after the fall semester (e.g. Total is summer 2006, fall 2006, intersession 2007 and spring 2007).

2.2 Briefly describe the program's activities and services in the past four years.

No entirely new courses and sections have been added to astronomy, physical science or physics, but CORs, lecture/lab content and methodologies of existing courses have been modified in keeping with scientific and technological advances. New CORs were submitted in 2008 to update astronomy with no major changes other than adding the MATH 102 prerequisite. For physical science, the existing CORs were revised and updated, after adapting the new inquiry-based curriculum in 2009.

Table 34. Number of Astronomy, Physics, and Physical Science Sections Taught from Summer 2006 to Spring 2010

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007***	**2007-2008***	**2008-2009**	**2009-2010**
ASTR 101 Astronomy	18	17	18	13
ASTR 101L Astronomy Lab.	15	13	13	7

PHYS 101 Introductory Physics	5	6	5	5
PHYS 102 Introductory Physics	1	1	1	1
PHYS 110 General Physics	3	3	3	4
PHYS 120 General Physics	2	2	2	2
PHYS 210/PHYS 211 General Physics	1	1	1	1
PHYS 210PS General Physics	1	1		
PHYS 210L General Physics Lab	1	1		
PSCI 101 Physical Science	19	17	14	10
Totals	**(64**) 66**	**(60**) 62**	**57**	**43**

* In Fall 2008, PHYS 210, 210PS, and 210L were combined into PHYS 211. To accommodate students who needed to retake just lecture or just lab, within an instructor's section, the students were assigned a PHYS X code so that the student could be tracked separated. Because these were not additional sections of physics classes, but only categories to track a student(s) within a section, these codes were not included in this table.
**Total sections if PHYS 210, PS, and lab had been counted as one course as in subsequent semesters.

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

The astronomy, physics and physical science areas have all received external funding in the last four years. Since 2006, with funding from a US Department of Education grant under the Title V of the Higher Education Act, Physics and Physical Science laboratories have been upgraded to incorporate technology and online activities. In 2007, twenty new laptops in a self-contained cart were purchased and configured to accept software for both physics and physical science. Funding from the same grant paid for the upgrade of the wireless system in SC2 136 where physics and physical science courses are held. The multimedia system for SC2 136 was also upgraded. The physics curriculum uses computer-based sensors and software from Vernier Software Inc., and has adopted the active learning curriculum Real Time Physics. Students also use laptops to perform simulations through ActivPhysics, an online simulation program. Physical science adopted Physical Science for Elementary Teachers, a similar active learning curriculum.

In summer of 2007, the division received a significant grant through an EPA with the United States Air Force Research Laboratory at Edwards Air Force Base to obtain new, modern equipment to enhance the astronomy laboratory. These items, a 12" reflector telescope, a solar telescope and imaging equipment, have been used in both the lab and lecture to improve instruction.

Area 3 Curriculum (3.5 and 3.6 updated annually)
3.1 Identify degrees and certificates currently offered in the program.

An AS in Physical Sciences requires ASTR 101 with lab, PHYS 101, PHYS 102 and PSCI 101. Students may select astronomy, physics, or physical science courses to complete requirements for the AA in Liberal Arts and Sciences. There are currently no specific astronomy or physics degrees or certificates. The physics/ physical science/ astronomy program has an established

course sequence that adequately serves the needs of students preparing to transfer to bachelor's degree-granting institutions.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

Since fall 2007, Astronomy 101 Honors is offered every second year. There have been no additions or deletions of course in the physical science area. Adding the MATH 102 prerequisite was a major revision for ASTR 101.

Expansion into the Palmdale Center is opening doors for students. Informal polls indicated that students wanted more science classes in Palmdale. With funding from a Title V grant, equipment was purchased to establish a lab for Physical Science. Since the creation of this dry science laboratory at the Center, the division has been able to schedule laboratory and lecture sections of Astronomy, Physical Geography and Physical Science. Student satisfaction will be surveyed.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

An online section of ASTR 101 has been offered for several years. Audio-visual aids, such as video, computer animations and images, have always been a big part of instruction in astronomy because the field incorporates such media already. Some instructors have recently added clicker-type conceptual questions to their teaching in physics and astronomy.

The physical science curriculum is a hands-on, learning-by-doing curriculum. Because of this, the online Physical Science class has been eliminated. Online instruction did not provide students with an experience equivalent to that of the face-to-face class sections. The curriculum does utilize technology to enhance learning. Videos, simulations and online resources support the text and classroom instruction.

3.4 Recommend ways to improve completion of certificate, major and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

The physical sciences area currently offers enough sections of lecture and lab and at various times (morning, evening, etc.) to accommodate student needs. The number of sections of PHYS 110 and 120 offered over the course of the year is planned to increase in spring 2011 to accommodate the increased demand for these sections. These courses are prerequisites for students pursuing engineering degrees. The increased demand correlates with AVC's partnership in the program to enable students to earn a bachelor's degree in engineering in Lancaster, initially through CSU, Fresno initially and now CSU, Long Beach.

3.5 Are all Course Outlines of Record (CORs) current?

As of fall 2010, all Course Outline of Record (CORs) are current and can be viewed at http://www.avc.edu/administration/organizations/app/mscors.html

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Faculty members match the Course Outline of Record (COR) with material in textbooks currently in use, section by section. When hired, faculty are provided with CORs of their assigned courses. Effort is made at division meetings, informal peer interaction, and faculty evaluations to communicate the importance of covering material as described in the COR.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

The Learning Center offers students assistance with the reading, writing and mathematics skills necessary to succeed in astronomy and physics. Tutoring, and sometimes SI, in physics, physical science and astronomy content areas are also available. Availability of students qualified to tutor in these subjects is sometimes a problem. Current budget limitations are also reducing access to tutors.

Classroom technologies such as LCD projectors and monitors, video presenters and computer simulations are in wide use. However, many office and lab computers are outdated, which limits attempts to incorporate new software or technologies.

Completion of the new Health & Sciences building, expected by fall 2012, will assist in allowing expansion of the program to meet future needs.

4.2 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

No changes to address for this section.

Area 5 Data Analysis and Environmental Scan (Updated annually)

5.1 The program was provided with a substantial amount of data from the Office of Institutional Research and Planning. The self-study team should review and have a dialogue on the data and then identify major changes or enrollment trends expected to be of particular relevance to the program in the next four years. Consider WSCH/FTES, success, retention and persistence as applicable, and the number of degrees and certificates, if applicable. Consider data on gender, age, ethnicity, night vs. day, etc.

a. **Write about enrollment trends that the self-study team believes are important to the program's planning and resource needs. Why might these trends be occurring?**
b. **Considering these trends, how well is the program doing in meeting the needs of the various learner populations attending the college?**

The student populations for physics, astronomy and physical science differ somewhat from the

demographics of the college as a whole, as presented in AVC's 2009 Factbook at http://www.avc.edu/administration/research/common/documents/FB/FB2009.pdf. For example, 59% of students at AVC are female. Astronomy students are 52% female and 47% male. This near equality is likely because astronomy only satisfies degree requirements in general education, which shows no gender bias. The students in physics are 33% female and 67% male. A possible explanation is that most of these students are going into engineering or related fields which are traditionally male-dominated. Conversely, in physical science the student population is 67% female and 32% male. This course is a requirement for pre-service teachers, a field dominated by females. There has been a slight drop in enrollment for both genders but this is most likely attributed to sections being cut due to budget constrains.

Ethnic diversity approximates that of the overall campus enrollment. In 2009-2010, nearly 1% of physics students were American Indian or Alaskan Native. The largest ethnic group of physics students, 42%, were "White non-Hispanic". Students identifying themselves as Hispanic comprised 26% of the remaining percentage. "Other and unknown" is the next largest group with 10%. Black Non-Hispanic students form 7% of the total and Asian or Pacific Islanders form 14%. For astronomy the numbers are respectively 1%, 44%, 26%, 11%, 13% and 5%. For physical science they are 1%, 41%, 27%, 11%, 16% and 4%. Faculty in physics, astronomy and physical science work with AVC's Outreach Office to encourage students of all ethnicities to succeed in STEM related subjects. Due to a change in the coding of ethnicity categories defined by the Chancellor's office in 2009, it is difficult to report on year-to-year trends in these data.

The campus age demographic has not seen significant changes recently. The majority of students are still from the 20-29 year old age bracket. Specifically, 26% of students in physical science are less than 20, 41% are between 20 and 24, 11% are between 25 and 29, 8% are between 30-34, 5% are between 35-39, 4% are between 40-49 and 2% are over 50. In astronomy, 41% of students are younger than 20; 40% between 20 and 24; 8% between 25 and 29, 3% between 30 and 34; 2% between 35 and 39; 4% between 40 and 49 and 2% are above 50. For physics, 31% of students are less than 20 years old; 47% between 20 and 24; 11% between 25 and 29; 4% between 30 and 34; 2.5% between 35 and 39; 2.7% between 40 and 49 and 1% are above 50.

Retention rate in most courses is high (roughly 90 percentile). In the last few years the astronomy program has seen a modest increase (~5%) in retention and this is likely attributed to the institution of the MATH 102 pre-requisite and the introduction of SLOs into the curriculum. No major trends are observed in success rates. The numbers are quite scattered. For astronomy the success rate ranges from 72% to 93%.

In physics, retention and success rate have seen a decrease (10 – 20%) in recent years. Retention rates for Physics 101 range from 68% to 92%, for Physics 110 from 71% to 95%, for Physics 120 from 93% to 100% and for Physics 211, retention is 100%. Of those students retained, success for Physics 101 ranges from 31% to 74.5%, for physics 110, success is between 50% and 80%. For Physics 120 the success rate is from 93% to 95% and for Physics 211, from 93% to 100%.

Retention rates in physical science range from 72% to 96%, with success of those students from 60% to 75%.

As shown in Table 5, only 19 degrees in the physical sciences have been awarded over the past 5 academic years. This represents slightly less than one percent of all degrees awarded in the division over that time period.

In summary, for astronomy and physical science, no major changes appear necessary in the course offering as a result of this data. For physics, an effort could be made to reach out to more female candidates to achieve a gender consistent with overall college enrollment.

5.2 Report on the progress of recommendations and accomplishment of goals identified in the program's last program review. Reflect on the strengths, weaknesses, and improvements of the program. Clearly state the performance/quality indicators used by the program.

The low retention and success rates in physics 101 can probably be attributed to the absence of necessary prerequisites (algebra and trigonometry). However, a study completed by the Office of Institutional Research does not validate the apparent need for these prerequisites. Yet, many of the concepts in this physics course require the knowledge of trigonometry. In addition, this prerequisite would align our curriculum with CSU and UC curricula. Discussion will continue as faculty try to diagnose this problem.

Too few students earn degrees in science from AVC. Only 13 AS degrees in Physical Sciences have been awarded since 2006. However, this does not reflect the number of successful science students at AVC because many students transfer to four-year institutions without applying for graduation from AVC. Nevertheless, division faculty should make a concerted effort, with support from the counseling and transfer offices, to increase the number of students working towards this award. Students may not be aware of the available degrees or the benefits of attaining such degrees.

Area 6 Student and Program Learning Outcomes Assessment (Updated annually)

6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

Instructors have been collecting, assessing and addressing SLOs for PSCI 101 since 2006 when inquiry-based curriculum was introduced. Since the 2008 program review, SLOs have been created for all courses in physics and astronomy as well. Following a full year of assessment in 2009-2010, instructors are beginning to institute changes in how the courses are taught to increase student success with respect to learning outcomes.

Faculty have entered and assessed SLOs for all ASTR, PHYS, and PSCI courses offered since 2009 except for PHYS 211. PHYS 211 assessment should start in Fall 2010. Documentation has

been updated recently in the 2009-2010 cycle to include labs as part of the whole course assessment. Actions taken on SLOs data will likely start in the 2011-2012 academic year, after a reasonable amount of SLO data has been collected to analyze trends. From this, faculty can discuss findings and make meaningful decisions regarding student learning.

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Adjunct faculty participates in gathering SLOs for ASTR, PHYS and PSCI courses. They have been informed about the importance of the SLOs through e-mails and personal contacts, as well as departmental meetings, for those who attended. Adjunct faculty are acknowledged as an important component of the SLO gathering process.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

SLOs for have been defined for 100% of courses offered in the physical sciences area. The goal for the next four years is to have 100% compliance for SLO reporting.

SLOs for PSCI 101, ASTR 101 and ASTR 101L are assessed in every cycle, with data coming from both full time and adjunct faculty. Currently, astronomy has assessed every SLO in every cycle but has not reported data for each SLO. Starting in the 2010-2011 cycle, data from every SLO will be reported.

In physics, currently half of the SLOs are being assessed for PHYS 101, 102, 110, 120. In the 2010-2011 cycle, the remaining SLOs will also be assessed in those classes. Assessment of PHYS 211 SLOs will start in the 2010-2011 cycle.

Astronomy can be used to satisfy general education requirements for some AVC degrees, but it is not a requirement for any specific programs. Physics and physical science are required for an AS degree in Physical Science. PLOs are currently being drafted for that program. Completion is anticipated at the end of the 2010-2011 academic year.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

All SLO data reported here is from the 2009-2010 cycle (Tables 35-41).

Table 35. ASTR 101 has five SLOs. The Introductory Astronomy Survey (IAS) is administered near the end of the semester after most instruction has occurred. This survey is based on the Astronomy Diagnostic Test (ADT) version 2.0 developed by the Collaboration for Astronomy Education Research (CAER) and was edited to fulfill the needs of the astronomy program at

AVC. All SLOs are measured using this assessment tool. Each SLO has four questions from the survey and a student is considered to have met the SLO goal if they are able to correctly answer at least three of the questions. The achievement target for SLOs 1-5 is for 70% of students to meet the SLO goal. Post-test results are as follows:

SLO	Number of Students assessed	ASTR 101 Assessment	Target
1		Not assessed in 2009-2010 cycle	
2	172	16% success	Not Met
3		Not assessed in 2009-2010 cycle	
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	

Revisions to the assessment tool need to be made to more accurately assess student learning. The first drafts of the edited IAS were deemed inadequate.

Table 36. ASTR 101L has three SLOs. The assessment tool for the ASTR 101L course is an exit survey that is administered on the last day of normal lab instruction near the end of the semester. Each SLO is given 3-4 questions on the survey to assess the gain of knowledge by the student. 70% of students answering 2 or more questions correct is considered passing. Post-test results are:

SLO	Number of Students assessed	ASTR 101L Assessment	Target
1		Not assessed in 2009-2010 cycle	
2		Not assessed in 2009-2010 cycle	
3	91	48% success	Not Met

Revisions to the assessment tool are necessary to more accurately assess student learning.

Table 37. PHYS 101 has five SLOs. Student learning (SLOs 1-4) are assessed using the Force Concept Inventory exam pre- and post-instruction. A normalized gain is calculated for the whole class. Criterion for success: a gain of 48% and above is considered satisfactory. A gain of 70% and above is considered mastery. SLO 5 is assessed by the grading of laboratory reports. Criterion for success: 70% of class earns an average of at least 7/10. Results are as follows:

SLO	Number of Students assessed	PHYS 101 Assessment	Target
1	39	13% success	Not Met
2	39	13% success	Not Met
3	39	13% success	Not Met
4	39	13% success	Not Met
5		Not assessed in 2009-2010 cycle	

More assessment needs to take place to properly evaluate student success in this class.

Table 38. PHYS 102 has seven SLOs. SLOs 1-3 are assessed using selected questions from the Conceptual Survey of Electricity and Magnetism (CSEM) test. Success criteria: 80% of the class will achieve a score of 70% on the CSEM subtest. SLO 4 is assessed using selected questions from the DIRECT test. Success criteria: 80% of the class will achieve a score of 70% on the DIRECT subtest. SLO 5 is assessed based on completion of laboratory assignments. Success

criterion: 90% of the class will earn more than 80% of the maximum score. SLO 6 is assessed based on instructor designed questions on midterm and final tests. Success criterion has not been defined for this assessment method. SLO 7 is assessed based on multiple choice questions in midterm and final tests. Success criterion: 80% of the class will earn at least 70% of the maximum score. Results are as follows:

SLO	Number of Students assessed	PHYS 102 Assessment	Target
1	14	14% success	Not Met
2	14	14% success	Not Met
3	14	14% success	Not Met
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	
6		Not assessed in 2009-2010 cycle	
7		Not assessed in 2009-2010 cycle	

More assessment needs to take place to properly evaluate student success in this class.

Table 39. PHYS 110 has six SLOs. SLOs 1-3 are assessed using the Force Concept Inventory pre and post instruction. A normalized gain is calculated for the whole class. Success criteria: a gain of 48% and above is considered satisfactory. A gain of 70% and above is considered mastery. SLO 4 is assessed using multiple choice questions in midterm and final test. A cumulative grade is tracked. Criterion for success: 80% of the class will earn 70% and above of the maximum score. SLO 5 is assessed based on completion of laboratory assignments. Success criterion: 90% of the class will earn more than 80% of the maximum score. SLO 6 is assessed based on cumulative performance of student problem solving in Context Rich Problems (homework set). Success criterion: 80% of the class will earn 70% of the maximum score. Results are as follows:

SLO	Number of Students assessed	PHYS 110 Assessment	Target
1	55	47% gain	Not Met
2	55	47% gain	Not Met
3	55	47% gain	Not Met
4		Not assessed in 2009-2010 cycle	
5		Not assessed in 2009-2010 cycle	
6		Not assessed in 2009-2010 cycle	

Improved research based methodologies will be expanded to all section offerings of the course in order for the average gain to increase to 60%. Instructors must review the current teaching methodologies of rotational dynamics, oscillations, and fluids that will enhance student conceptual understanding. Centripetal force apparatus would enhance laboratory experience for students. Budget Amount Requested: $1800

Table 40. PHYS 120 has seven SLOs. SLOs 1-3 and 5 are assessed using selected questions from the Conceptual Survey of Electricity and Magnetism (CSEM) test. Success criteria: The class will demonstrate a pre-post normalized gain of at least 48% (national average). SLO 4 is assessed using selected questions from the DIRECT test. Success criteria: 80% of the class will achieve a score of 65% on the DIRECT subtest. SLO 6 is assessed based on completion of laboratory assignments. Success criterion: 90% of the class will earn more than 89% of the

maximum score. SLO 7 is assessed based on multiple choice questions in midterm and final tests. Success criterion: 70% of the class will earn at least 60% of the maximum score. Results are as follows:

SLO	Number of Students assessed	PHYS 120 Assessment	Target
1	11	8% gain	Not Met
2	11	8% gain	Not Met
3	11	8% gain	Not Met
4		Not assessed during 2009-2010 cycle	
5	11	8% gain	Not Met
6		Not assessed during 2009-2010 cycle	Met
7		Not assessed during 2009-2010 cycle	Met

RLC (resistor/inductor/capacitor) sets are requested for students to work with in the laboratory.
Budget Amount Requested: $690

PHYS 211 has four SLOs. All SLOs are assessed using questions on multiple choice test. Success criterion: At least 70% of class will earn at least 70%. SLOs were not assessed in the 2009-2010 cycle, but will be assessed in the 2010-2011 cycle.

Table 41. PSCI 101 has seven SLOs. SLO 1 is based on an instructor-designed test to calculate simple quantities from mathematically formulated principles. 80% of the students will score at least 70% of the maximum score. SLO 2-6 are assessed using a test administered pre/post instruction and the normalized gain will be calculated using the following formula: (post-pre)/(20-pre). A gain of 60% and above represents mastery. SLO 7 is assessed based on completion of laboratory assignments. Success criterion: 90% of the class will complete at least 70% of the assignments.

SLO	Number of Students assessed	PSCI 101 Assessment	Target
1	129	79% success	Met
2	129	54% gain	Met
3	129	54% gain	Met
4	129	54% gain	Met
5	129	54% gain	Met
6	129	54% gain	Met
7	129	> 90% success	Met

Success in all target areas was an unexpected and exciting result. We will continue to administer the pre/post conceptual test and try to exceed the 54% gain of the 2009-2010 cycle.

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

The program is responsive to needs of students in the TAP/Honors Program by offering an

honors section of ASTR 101 in alternating years.

The program utilizes resources provided by the Learning Center, including SI and general tutoring when they are available. It is sometimes a challenge to find appropriate tutors for astronomy, physics, and physical science. Getting students to take advantage of these services is also a problem. Faculty has been instructed to encourage students to use the Learning Center resources.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

Area faculty members have been very active in community outreach and a variety of activities designed to promote STEM education in the Valley. Faculty members have been participating in the Antelope Valley Math Science Engineering and Technology consortium (MSET) since its founding in 1999. Faculty members also continue collaboration with middle school and high school science teachers which was established as early as 2002. Contacts developed in 2002/2003 through grants with NASA and Boeing are also maintained. The summer academies for math and science middle school teachers were held in 2008 and 2010 with funding from the AVC Title V grant. The 2006 Tile V grant (described in detail in section 2) was collaboration between AVC, CSUB, and Fresno State with an overarching goal of increasing the number of AVC students pursuing STEM majors and specifically to encourage students to enroll in the Fresno State local engineering program housed in the Lancaster University Center. The $3.5 million grant is ending this year but faculty have already submitted a new proposal for another $6 million over the next year, this time in collaboration with CSU Long Beach, College of Engineering which is taking over the administration of the local engineering program. In preparing this proposal, faculty have made contact with over 30 industry representatives, and faculty and staff from Cerro Coso Community College as well as from Long Beach State.

Faculty members have also being active in assisting local K-12 efforts in STEM by attending career days, judging science fairs, assisting teachers in their classrooms, and the NASA Bon-Meyer Math and Science Odyssey. During 2009 and 2010 regular visits took place at the AVC SOAR High School and Littlerock High School.

Area 9 Goals and Objectives (Updated annually)
List the goals and objectives the program has for the next four years.

Goal 1: Increase the number of students pursuing transfer in STEM majors, and especially in engineering.
Objective: Increase enrollment in PHYS 110 and 120 by offering additional sections of PHYS 110 and 120 in the spring and fall semesters of each year.
Time Frame: 2010-2011 academic year
Justification: Increased numbers of students prepared for transfer in STEM would be attracted to the local engineering program administered by CSULB, housed at the Lancaster University Center. This effort is in response to requests from local industry who need more local talent with STEM training.

Goal 2: Ensure proper preparation of students entering physics 101 and 102.
Objective: Increase the math standards for the students taking PHYS 101 and 102 by revising the COR to require MATH 135 (Plane Trigonometry) and Math 130 (College Algebra) or Math 140 (Pre-Calculus) as a pre-requisite for PHYS 101.
Time Frame: It is hoped that the paper work will be submitted to AP&P by Fall 2011.
Justification: Many of the concepts in physics require the knowledge of trigonometry. In addition this prerequisite would align our curriculum with CSU and UC curricula.

Goal 3: Continue the implementation of active learning methods in the classroom.
Objective: Replace and/or upgrade existing technology based tools in physics/physical science/astronomy to take advantage of the latest innovations in teaching pedagogies. **Time Frame:** Open
Justification: Newer equipment will allow us to further develop and improve our laboratory assignments.

Goal 4: Pursue external funding that will sustain the existing efforts for curricular reform.
Objective: Encourage and assist faculty to apply for grants from the US. Department of Education, the National Science Foundation, and the Department of Defense. Explore the expansion of the existing collaboration with Air Force Research Laboratory Edwards Air Force Base (AFRL-EAFB).

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

Adjunct faculty currently teaches 54% of classes in the physical sciences. The percentage had increased from 43% in 2006-2007 to 63% in 2008-2009.

The full-time instructors for these classes are two physics, one astronomy, one physical science (who also teaches chemistry), and one geology (who also teaches astronomy and physical science). With the increased offerings in physics to accommodate student demand, an additional full-time physics instructor is sought.

Day-time laboratory technician requirements for the Lancaster campus are currently adequate. However, courses at the Palmdale center and during the late afternoon evening time period at the Lancaster campus are unsupported. Instructors who teach there and students who take classes there are at a disadvantage.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

The need for adequate storage and classroom space will be met when the Health and Sciences building is occupied. Laboratory activities in astronomy will be enhanced with the building's planetarium and observation deck. Equipment needs are the following:

Needed for all Physical Science Areas	Quantity	Unit Price	Total Price
HP Laptop computers to replace older ones	20	$1250	$25,000

Needed for Physics	Quantity	Unit Price	Total Price
Centripetal Force Apparatus	6	$300	$1800
RLC (resistor/inductor/capacitor) sets	6	$115	$690

The addition of this equipment would allow students more hands-on experiences with physics principles instead of relying on computer simulations.

Needed for Astronomy	Quantity	Unit Price	Total Price
Equipment for virtual science laboratory (projector, lighting and sound, software)			
Handheld refracting telescopes	12	$100	$1200
Laser collimator to calibrate telescopes	1	$300	$300
8-inch reflecting telescopes to replace existing	2	$1200	$2400
Telescope base for solar telescope. (Current one doesn't have a base)	1	$300	$300
Software to operate spectrometer and CCD camera	1	$650	$650

The equipment listed will allow us to better educate and prepare students to succeed in astronomy.

10.3 Identify funding needed to support student learning.

As described in Goal 4 (Area 9), faculty will pursue grant opportunities for funding of these needs listed in Area 10.2.

Program Area: Water Treatment

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

The Water Treatment courses were developed by local professional water treatment plant operators utilizing a nationally recognized and standard curriculum developed by the American Water Works Association. This was done to respond to community need for additional qualified workers resulting from expansion of water treatment facilities in the area. The intent of these non-credit courses was to prepare interested students for the California State Licensure examination. Courses were offered as non-credit courses until 2009-10. With the direction of a local Advisory Board, comprised of water treatment plant operators, the courses were rewritten as credit courses and discussions were held concerning the creation of a degree and certificate program in Water Science. The credit courses were presented for the first time in the 2010-11 Course Catalogue and academic year. This area has never had a full-time instructor and twice was partnered with Cuyamaca College who were to provide further guidance with curriculum and program development. Although twice informed they were recipients of the grant, the funds were withdrawn by the Chancellor's Office.

Table 42 shows the enrollment and staffing characteristic of the non-credit water treatment courses.

Table 42. Enrollment and Staffing Characteristics of the Water Treatment Courses 2006-2020.

	2006-2007		**2007-2008**		**2008-2009**		**2009-2010**	
	Fall	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**	**Fall**	**Spring**
LHE	**105.5**	**103**	**135**	**154**	**142.1**	**143.3**	**143.2**	**108**
*Year Total	252.5		352		328.4		304.2	
Enrollment	**375**	**407**	**452**	**475**	**522**	**522**	**539**	**433**
*Year Total	952		1123		1234		1158	
FTEF	**7.0**	**6.9**	**9**	**10.3**	**9.5**	**9.6**	**9.5**	**7.2**
*Year Total	14.3		23.5		21.9		20.3	
FTES	**94.6**	**102.4**	**114.6**	**128.9**	**136.4**	**133.5**	**150.7**	**113.7**
*Year Total	265.8		370.5		345.7		320.2	

*Year total includes summer before and intersession after the fall semester (e.g. Total is summer 2006, fall 2006, intersession 2007 and spring 2007).

2.2 Briefly describe the program's activities and services in the past four years.

In semesters after spring 2010, the courses listed in Tables 39 and 40 will no longer be offered. Courses in this program were modified to become for-credit and were renumbered accordingly.

Table 43. Number of Water Treatment Sections Taught Summer 2006 to Spring 2010

	Sections offered in ACADEMIC YEAR (Summer to Spring)			
COURSE	**2006- 2007**	**2007-2008**	**2008-2009**	**2009-2010**
WDTO 901 Applied Water Treat I&II		1	1	
WDTO 905 Basic Water Supply Science				
WDTO 910 Water Chemistry & Quality				
WDTO 915 Water Distribution I		1	2	1
WDTO 916 Water Distribution II			1	
WDTO 920 Water Treatment 1		1	2	1
Totals		**3**	**6**	**2**

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years? If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

Twice the fledgling water treatment program was to be included in a workforce development grant from the Chancellor's office to Cuyamaca College; however, in both instances the funds were withdrawn because of state budgetary constraints.

Area 3 Curriculum (3.5 and 3.6 updated annually)

3.1 Identify degrees and certificates currently offered in the program.

Although a certificate program has not yet been formally established, student successfully completing the water treatment courses are eligible to take the California state licensure examination. Successful completion of this test can lead to employment in the water industry. It is anticipated the curriculum in this program will be expanded to include laboratory and practicum experiences that will result in a Chancellor's Office approved certificate program.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

As a CTE program, the courses in water treatment do provide skills and knowledge that can lead to employment in the water treatment field with public and private utilities. Faculty report increased demand for the classes because students want to pursue jobs in this field.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

The curriculum at present is primarily theory based and there is a need to introduce the practical more applied aspects of water treatment. Students need to be exposed to the hands-on mechanics and fluid dynamics of water preparation systems through laboratory activities and visits to

operational water treatment plants. Moreover, they should have a sound theoretical and practical understanding of water chemistry and microbiology.

3.4 Recommend ways to improve completion of certificate major and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete their programs within a reasonable time frame?

Ideally, a full-time faculty member would be hired and take the lead in the development of the certificate program leading to Chancellor's Office approval. Otherwise, existing adjunct faculty members will work to further develop and mature the program.

3.5 Are all Course Outlines of Record (CORs) current?

All CORs for water treatment courses are current.

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

The water treatment faculty recognizes the importance of utilizing CORs when designing course syllabi, which are submitted to the Division office each semester. The importance of including the CORs in syllabi has been a subject of professional development (FLEX) presentations. It is also part of the faculty evaluation process. Evaluators look at the incorporation of CORs into syllabi and lectures.

Area 6 Student and Program Learning Outcomes (PLO) Assessment (Updated annually)
6.1 Briefly review program outcomes assessment activities over the past four years and assess in some detail the effectiveness of those methods in documenting and improving student learning.

Student Learning Outcomes were developed for all water treatment courses. Assessment of these courses is in progress. Program Learning Outcomes will be

6.2 How have adjunct faculty and/or part time staff in your program been made aware of the need to assess Student Learning Outcomes (SLOs) and Program Learning Outcomes (PLOs) and been included in assessment activities?

Via email, faculty professional development activities, division and department meetings, instructors are encouraged to complete SLO assessment.

6.3 What specific plans have been made for assessing student learning over the next four years? Programs should provide a timeline for defining and assessing all SLOs and PLOs.

The goal for the next four years is to have 100% compliance for SLO reporting and the preparation of PLOs.

6.4 If the program SLO and PLO assessment results make it clear that particular professional development resources or student services are needed to more effectively serve students, describe the need. List items in order (rank) of importance.

In the absence of SLO and PLO assessments, it remains that additional curricular development is needed to fully develop the water treatment/sciences program.

1. Laboratory Practicum and experiences in regional water treatment facilities.

Area 7 Collaboration with Other Programs
Discuss collaborative efforts undertaken with other Instructional, Student Services or Administrative programs. Offer an assessment of success and challenges and note potential changes in collaborative efforts.

It is anticipated that the curriculum in the water treatment degree program will include courses in water chemistry and water microbiology. These courses will be offered by departments of Chemistry and the Biological Sciences, respectively.

Once the certificate and degree programs in water sciences are established, a close association with Counseling will have to be established to assist with the recruitment of students to the programs.

Area 8 Outreach Activities
Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

Faculty in the water treatment program works closely with the local water treatment facilities and organizations, particularly the Palmdale Water District, to stay current with employer needs.

Area 9 Goals and Objectives (Updated annually)
List the goals and objectives the program has for the next four years.

Goal 1: Rebuild and convene the Water Treatment Advisory Committee.
Objective: To ensure the courses that count toward certification and licensure in water treatment are relevant to industry standards.
Time frame: By Fall 2011
Justification: This is a crucial component to meeting our program's mission and the college's, as well as ILOs 2 and 6.

Goal 2: Complete the conversion of the non-credit water treatment courses to credit courses and determine if additional courses are required.
Objective: Fully develop the certificate and degree programs including practical/laboratory and field experiences.
Time Frame: 2011-2012 academic year.
Justification: Healthy drinking water is vital to all communities in the high desert.

Goal 3: Explore the creation of a program in water sciences.
Objective: Fully assess the need for a certificate or degree program to deal with the handling of drinking water, water for agricultural and industrial purposes, and waste water management.
Time Frame: 2011-2012 academic year.
Justification: Water is a resource of limited yet vital supply.

Area 10 Long Term Resource Planning (Updated annually)
If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

The water treatment program is taught by adjunct faculty members who have experience as water treatment professionals. For the continued maintenance and expansion of the program, a full-time faculty member is required.

10.2 List facilities (remodels, renovations or new), equipment and technology needed to provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

There is a need to provide students of water treatment with practical applied experiences. This could be achieved through the development of laboratory practicums and the establishment of cooperative arrangements with local civic, county and federal water preparation and treatment facilities. An on campus laboratory would be welcomed.

10.3 Identify funding needed to support student learning.

The water treatment program needs $500.00 annually to support the preparation of materials for student use.

Program Area: Mathematics

Area 1 Mission

1.2 Comment on the areas of the mission, vision, and Institutional Learning Outcomes (ILOs) of the college that are most closely related to the mission of the program.

Antelope Valley College is committed to provide Associate Degree programs in liberal arts, the social and natural sciences, and technical education. The college also provides transfer courses and basic skills courses in reading, writing, and mathematics. Solving problems using critical thinking skills and demonstrating a breath of knowledge and experiences from the natural sciences and mathematics are among the college's identified ILOs. The Department of Mathematics offers an Associate Degree in Mathematics as well as basic skills courses that are essential for success in college level degree applicable courses. Our transferable collegiate curriculum includes problem solving, analytical and critical thinking skills as well as computational skills that enable our students to enroll in upper division programs at four-year institutions and be life long learners.

Area 2 History

2.1 Identify major changes and/or developments, including change or growth in other programs, which significantly impacted the program in the last four years.

a) The mathematics program at Antelope Valley College was impacted by the national and state wide economical situation which eventually resulted in the reduction of community colleges' budget. The budget cut reduced the number of LHEs from the high 583 in fall 2009 to 518 in spring 2010, the lowest since spring 2005. The number of FTES generated by our department dropped from 693.20 in fall 2008 to 644.10 in fall 2009. The number of courses offered by our program that had maintained at the same level, 176, from Fall 2007 through Spring 2009 was increased to 181 in Fall 2009 but dropped to 166 in Spring 2010, the lowest in four-year period. Less course offering in turn reduced the number of "Seats Filled" from its highest 5519 in fall 2009 to 5057 in spring 2010. (Tables 1 and 2).
b) In a two-year period since fall 2008 through spring 2010, the Mathematics Department lost 3 of its full-time faculty. Naturally, the number of adjunct faculty was increased to the high 37 in fall 2009 but dropped to 29 in spring 2010 (Tables 1 and 2).

Table 1. Enrollment and Staffing Characteristics of Mathematics Courses 2004-2007.

Data	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007
Course Count	147	153	163	166	171	173	176
LHE	461.6	491	522.1	542.1	557	569.5	576.5
FTES	456.86	435.49	478.70	448.57	509.22	510.79	582.43
Full-Time	15	16	17	18	19	18	20
Adjuncts	32	30	33	35	32	32	28
Seats Filled	3552	3357	3813	3501	3854	3778	4464

Table 2. Enrollment and Staffing Characteristics for Mathematics Courses 2008-2010.

Data	Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010
Course Count	177	176	176	181	166
LHE	580.3	574.4	577.6	583	518
FTES	589.74	693.20	673.71	644.1	N/A
Full-Time	20	17	18	20	18
Adjuncts	27	31	33	37	29
Seats Filled	4417	5434	5105	5519	5057

c) The ever expanding Mathematics, Science and Engineering Division selected its' Math and Science Department Chairs for the purpose of sharing the workload that included curriculum development and class scheduling.

2.2 Briefly describe the program's activities and services in the past four years.

In addition to our regular course offerings and utilizing services available in the Learning Center, the Department of Mathematics has been actively involved in:
a) Expanding its outreach program to create a workable condition and establish longer lasting connections with the Antelope Valley Union High School District and other school districts.
b) Grant writing for the purpose of funding several college, high school, and middle school initiatives.
c) Offering variety of in-class technology workshops, "Teacher to Teacher" conference, and Mathematica workshop.
d) Participating in several state wide faculty-driven projects and committees such as "Centralized Assessment Project" and "DIG/C-ID Conference". Math Department has representatives in college committees such as AP&P, Senate, Students Success and Equity, and Basic Skills.

2.3 Did the program receive outside funding (e.g. Perkins IV and/or grants) during the last four years/ If yes, briefly identify the years funded and how those funds were used to improve the program and student learning.

The Minority Science and Engineering Improvement Program (US Dept. of Education,MSEIP) grant was funded in October 2006 and lasted through September 2010. The grant was used to provide technology in our classrooms and expand our Prime Room (ME 100) activities. It provided funding to establish College Pre-Assessment workshops, to hire temporary hourly instructors for the busy final-month, and in-class tutors for several of our basic skill classes. The grant enabled us to extend our outreach program by offering Pre-Assessment Workshops for high schools and to provide computers needed to start a computer lab (SV1A) in the Palmdale Center.

Area 3 Curriculum

3.1 Identify degrees and certificates currently offered in the program

The Mathematics department currently offers an Associate Degree in Mathematics.

3.2 Discuss the adequacy of course offerings relative to appropriate aspects of the college mission and ILOs. Summarize recent additions, deletions, or revisions of courses.

Our course scheduling contributes to strong enrollment. Courses are offered at many different time slots and at various options, such as one day, two days, three days or four days per week. Classes that are in great demand are offered mornings, afternoons, late afternoons, and evenings. We also offer Friday only classes and Saturday only classes to accommodate our working students and the students who have family obligations. A larger number of classes are offered at the Palmdale Center to accommodate students from that area.

Our math program offers many transfer courses, such as Statistics, Trigonometry, College algebra, Calculus, differential Equations, Linear Algebra, Math for Elementary School Teachers, and Math for Business that are equivalent to their counterparts at four-year institutions.

We offer many sections of basic skills math courses. These non transferable courses help students develop strong foundational math skills enabling them to successfully complete the general education requirements needed for various academic and career technical programs.

Due to low enrollment, MATH 110 (Mathematics for Liberal Arts) and MATH 210 (Discrete Mathematics) have become obsolete courses. MATH 135 (Trigonometry) course has been revised to include vectors; a topic much needed for physics and advanced math courses. We also made Plane Euclidean Geometry (MATH 080) as a pre-requisite for MATH 135.

3.3 Reflect on the relevant trends in curriculum with regard to knowledge requirements and instructional methods.

In addition to traditional lecture our faculty is trained in the use of collaborative learning, use of technology to enhance teaching and learning, self-paced learning, online teaching, and assigning individual and group projects. Technology enhanced courses are regularly offered for both developmental and advanced courses. The recent availability of in-class tutors for some basic skills courses is expected to contribute to better success rate.

Both math faculty and counseling staff make sure that students meet the pre-requisites requirements.

3.4 Recommend ways to improve completion of certificate, major and transfer requirements. Are all courses offered on a regular rotational basis so that students can complete within a reasonable time frame?

Transfer level courses and degree-required courses are offered in every regular semester. Efforts are made in our course scheduling to offer at least one evening section for advanced courses. A recent study (Divided we fail, Institute for Higher Education Leadership & Policy, CSU Sacramento, Oct. 2010) indicates that students who pass college level math within two years have much higher rates of completing certificates, degrees or transfers. The Mathematics Department should seek innovative practices that change students' math study habits. Possible practices include:

- Offering accelerated developmental courses. Accelerated developmental math courses have already been established in many colleges and can be developed in our department as well.
- As a by-product of AVC-PAWs (Pre-assessment Worshops), all AVC basic skills math students have access to free tutorials and unlimited number of practice problems. The Mathematics Department can take advantage of this service.

3.5 Are all Course Outlines of Record (CORs) current?

By the end of the fall 2010 semester, all course outlines will be current.

3.6 How does the program ensure that all faculty utilize CORs when designing course syllabi?

Our faculty members match the outline of record with the material in the textbooks currently in use, section by section. Full-time faculty performs peer evaluations of both full-time and adjunct faculty. During the evaluation process we review our peers' syllabi to make sure they are within the parameters described in the Course Outline of Record. Standardized final examinations are administered in MATH 050, 060, 070 and 102 to assure compliance to the COR in these high numbers of sections courses.

Area 4 Student Support and Development

4.1 Discuss the adequacy of program services, practices, and technology to address diverse student needs and support student achievement.

Learning Center/ Math Center. The mathematics program at AVC identifies the support needs of students and provides appropriate services. The Math Learning Specialist in the Learning Center provides workshops at the beginning of each semester for students to get a quick review of what they should know for the courses they are taking. She also provides workshops throughout the semester with a scheduled workshop program for different math topics and math skills and strategies.

If instructors request, they may have a Supplemental Instruction tutor assigned to a class, to attend the classes and provide supplemental instruction sessions. Trained peer tutors are available on a drop in basis in the Learning Center, under the guidance of the Math Learning Specialist. Drop in tutoring is provided for all math classes for students enrolled in LAC 900 (Supervised tutoring), a zero unit class with instructor of record the Math Learning Specialist.

One-on one tutoring by appointment is provided for basic skill class students referred by OSD. Tutoring by appointment is offered also through group tutoring for basic skills students.

MATH 099, a self-paced math class, is managed by the Math Learning Specialist in the Math Center. This unique class allows a student to move at a slower or a faster pace than that of the normal class. In MATH 099 a student can get credit for any one of the courses from MATH 050 to MATH 140. The math center creates and houses all the learning resources including students' individual folders, trains in class tutors and uses its own database for recording and retrieving students' data for positive attendance. The learning specialist manages students' records in banner.

The math center provides resource materials (books, handouts, calculators, DVDs and different software tutorials for students of math and math related classes. The Math Center provides support for lab components of MATH 050, 070 and 102 A and B classes. The Math Center proctors make up tests for different math classes.

The Math Learning Specialist teaches two 0.5 unit classes: Managing Math Anxiety (MATH 020) and Math Study Strategies (MATH 021).

Computer Lab.
There is a dedicated computer lab, The Prime Room, on campus (ME 100) which is open 35 hours a week for students to do online homework, with a technician available who helps with software and math problems. This lab and the technician have become invaluable to the online component of the math program.

MSEIP Grant.
The grant from the US Department of Education, Minority Science and Engineering Improvement Program has helped us address changes in the student population, by increasing the number of minorities in the science pipeline that leads to undergraduate and graduate studies. The goal of the grant is to reduce attrition and increase success in basic skills level mathematics classes, our biggest challenge.

Diversity.
The math program serves and supports its diverse student population. Math classes are offered to persons of all ethnic origins. One means of enhancing the learning experience for a diverse student population is to offer a variety of teaching methods and styles and a variety of support services, as described above.

The math division has certainly contributed to a healthy campus environment by hiring new instructors with very diverse backgrounds. Of the 16 full time math faculty, nine were born outside the United States. In the pool of adjunct math instructors the proportions are similar.

In spite of all the support provided by the Math Center, the Math Computer Lab and individual instructors, faculty still observe lack of study skills and of resourcefulness in their students. The creation of a mandatory orientation for math students (or campus wide) might make an impact. Topics covered in an orientation might include:

how to take notes;
how to recognize when you know (or don't know);
managing your schedule;
attendance is not enough – how to do homework;
why/how to arrive on time;
why/how to stay until the class ends;
how/where to research;
citing sources;
reading graphs;
presentation of homework and projects (clear and precise);
help with proofreading and accuracy;
using e-mail and other technology;
when not to use technology;
how to get help;
how to seek out the answer before you ask for help;
meeting deadlines(in a company you must meet deadlines or your company fails);
imagine the classroom is a job interview; and
sleep.

4.2 Summarize how recent additions, deletions, or revisions of services, practices, and technology support aspects of the college mission and ILOs.

Online Classes. The number of online math class offerings has increased over the past three years. This format serves those students unable to travel to campus frequently, due to medical conditions, travel difficulties and a number of other issues. We are thus enhancing support for a more diverse student body.

In-class tutoring. The Basic Skills Committee has funded a new in-class tutoring project which has seen substantial success in MATH 050, 060 and 070. The majority of students in those classes believe the in-class tutors help a great deal with their understanding and instructors report improved communication with their students.

PAWs. The innovative Pre-Assessment Workshop program has been highly successful. Initiated in November of 2009, and supported by funds from the MSEIP Grant, these workshops provide prospective students with review and practice to improve their performance on the math assessment tests. AVC students characteristically perform poorly on the assessment tests and are often placed into classes below their actual skill levels. The Assessment Office has seen marked improvement in performance as a result of the PAWs workshops. We have already served 850 students.

AVC faculty have coordinated with the high schools to provide PAWs on their campuses as well. The goal is to channel high school graduates into the proper level of math class in the freshman year. There was a very positive response from the high school faculty in regard to this plan. Five high schools started the PAWs in May and will continue this year (More detail is in Area 8: Outreach).

The Title V grant will provide funding for PAWs from 2010 and onward. The recent additions and enhancements have helped us to meet the college's ILOs and mission. Our students can acquire basic skills and are able to transfer to a higher education institution at a faster rate as it was the intention on both MATH 099, the in-class tutoring program, and PAWs.

Projectors in the classrooms. In the past two years, technology in math classrooms has been improved with the installation of permanent computers and projectors.

Area 5 Data analysis and Environmental Scan (update annually)

The math program data indicates that, the average FTES per semester for the academic years 2004-2009 was 537.87 (Tables 1 and 2). Always the FTES for fall is more than the spring. There was a continuous increase in FTES for fall and spring from spring 2006 to fall 2009. The number of full time instructor dropped in spring 2010 by 10% and the adjunct instructors dropped by 21.6% compared to 2009. These were a direct impact of the budget cuts. The lower number of adjunct and full time instructors more FTES taught. The division becomes more efficient in teaching more students with less number of instructors.

For basic skill program, the data shows that, 900 students enrolled in MATH 050, 43 of them completed successfully math 102 after three years (4.8% success rate)
165 students enrolled in MATH 060, 48 students completed successfully MATH 102 (23.0% success rate)
280 students enrolled in MATH 070, 135 students completed successfully MATH 102 (48.2% success rate). This indicates that the higher math class enrollment the higher success rate.
This is also an indication that the some of the students that are enrolled in MATH 050 would not pursue a higher education; they would like to enroll in vocational studies. These data excluded gender, age, ethnicity night vs. day studies and type of program (Regular or EDUCO).

The number of students enrolled in math classes continuously increased from 2005-2009 for both fall and spring semesters. In spring 2010there was a drop in number of students compared to 2009 by 452 students which is 9.26%. The number of female students is more than the male students (Table 5). The median ration is 0.622 and varied only in second and third decimal places from fall 2005-2010. The ethnicities of the students are American Indian or Alaskan Native, Asian or Pacific Islander, Black Non- Hispanic, Hispanic, White Non- Hispanic and Others. From fall 2005 – spring 2010, the median ethnicities are:

Black non Hispanic	18.7%
Hispanic	31.2%
White Non- Hispanic	35.7%
Others	7.1%

There was a drop of Black non Hispanic, White Non- Hispanic and Hispanic enrollments. The others ethnicity increased to 36.9% in spring 2010. This probably resulted from students not willing to report their ethnicity (Table 3).

The majority of students' age is less than 20 years (Table 4). The median age for the period of fall 2005-spring 2010 are:

Less than 20	38.8%
20-24	32.0%
25-29	9.2%
30-34	5.5%
35-39	4.3%
40-49	7%
50 plus	3.4%

In spring 2010 the students' age less than 20 years decreased by 9% compared to fall 2009, while the 20-24 years age increased by 5% for the same period.

The median female student is 61.7%, while the male median is 37.9%. The median degree obtained in mathematics from 2005 -2010 is 9.

Table 3. Ethnicity of Mathematics Students.

	Black Non Hispanic	Hispanic	White Non Hispanic	Others
Fall 2005	17.7%	27.2%	41.2%	6.4%
Spring 2006	20.3%	28.1%	38.5%	6.1%
Fall 2006	18.6%	31.0%	37.6%	6.6%
Spring 2007	19.8%	31.4%	34.8%	6.7%
Fall 2007	16.9%	33.0%	35.7%	7.2%
Spring 2008	19.8%	32.9%	32.9%	7.1%
Fall 2008	18.8%	33.0%	33.9%	7.5%
Spring 2009	21.2%	34.0%	31.3%	7.3%
Fall 2009	15.0%	24.9%	24%	31.2%
Spring 2010	13.6%	23.3%	21.5%	36.9%

Table 4. Ages of Mathematics Students.

	Less than 20	20-24	25-29	30-34	35-39	40-49	50 +
Fall 2005	45.2%	28%	7.9%	5.3%	3.9%	6.9%	
Spring 2006	37.4%	32.8%	9.5%	5.7%	3.8%	7.7%	2.8%
Fall 2006	47.6%	25.9%	8.6%	4.6%	4.1%	5.8%	3%
Spring 2007	37.7%	34%	9.8%	5%	3.9%	5.9%	3.3%
Fall 2007	46.8%	26.8%	8.4%	4..8%	3.6%	5.7%	3.4%
Spring 2008	35.6%	34.2%	9.6%	5.7%	4.4%	6.7%	3.4%
Fall 2008	42.8%	29.2%	8.8%	5.3%	4%	6.2%	3.4%
Spring 2009	34.5%	33.7%	9.7%	6%	4.7%	7.1%	4%
Fall 2009	40.1%	31.3%	8.9%	5.1%	3.8%	7.1%	3.4%
Spring 2010	31.6%	36.6%	10.3%	5.8%	4.3%	7.2%	3.8%

Table 5. Gender of Mathematics Students.

	Female	Male
Summer 2005	61.1%	37.4%
Fall 2005	59.2%	39.9%
Spring 2006	60.8%	39.2%
Summer 2006	63.5%	35.2%
Fall 2006	61.7%	37.3%
Intersession 2007	63.4%	34.8%
Spring 2007	60.5%	38.4%
Summer 2007	61.9%	36.7%
Fall 2007	61.1%	37.7%
Intersession 2008	63.8%	34.7%
Spring 2008	60.8%	38.3%
Summer 2008	62.0%	36.5%
Fall 2008	60.8%	38.1%
Intersession 2009	64.4%	34.5%
Spring 2009	60.2%	38.7%
Summer 2009	62.4%	36.5%
Fall 2009	60.9%	37.9%
Intersession 2010	64.8%	34.1%
Spring 2010	61.1%	37.7%

Area 6 Student Learning Outcomes & Program Learning Outcomes

During the past 3 years, since our past Program Review in 2007, the Mathematics Department has developed Student Learning Outcomes (SLOs) for all Math courses and has been assessing them every semester. Assessing SLOs started in the 2009-2010 academic year and data were entered on WEAVE. As anticipated during the first year SLO collection and assessments, not every SLO was tested. There was also organizational confusion. Facilitators were not properly trained and their communication with faculty was not at its best. The following tables illustrate department's effort in collecting SLOs.

Table 6. Assessment of MATH 050 SLOs.

SLO	TESTED	PASSED	RATE
SLO #2	534	283	53%
SLO #4	534	244	46%

No action plan is defined for these SLOs.

Table 7. Assessment of MATH 060 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	554	467	84%
SLO #2	554	522	94%
SLO #3	508	278	54.7%
SLO #4	508	285	56.1%

Action Plan: None needed for SLO ' s 1 & 2
SLO #3 was tested on Factoring and simplifying exponents. We need to make sure that the students know how to find the GCF and know all the properties of exponential.
SLO# 4 was tested on American and International metric. In order to improve the passing rate, we need to make sure that the students know the conversions between the systems and improve their algebraic skills.

Table 8. Assessment of MATH 070 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	480	290	60.4%
SLO #2	436	309	71%
SLO #3	480	399	83.1%
SLO #6	436	304	70%

Action Plan: None needed for SLO's 2, 3 & 6.

SLO #1 was tested on Algebraic expression. There were students who were not well prepared for this section. Reviewing sections before the lecture will help to improve the passing rate.

Table 9. Assessment of MATH 080 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	29	20	69%
SLO #2	27	20	74%
SLO #3	6	5	83%

Action Plan: None needed for SLO 's 2 & 3
Very close to achieving our target for SLO # 1

Table 10. Assessment of MATH 102 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	447	337	75%
SLO #3	447	301	67%
SLO #4	382	248	65%

Action Plan: None needed for SLO #1
For SLO #3 & #4, we were close to achieving our target. There were a lotof materials for one semester. We need to get the students more engaged in practicing out side the classroom.

Table 11. Assessment of MATH 115 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	308	198	64%
SLO #4	306	150	49%

No action plan is defined for these SLOs.

Table 12. Assessment of MATH 120 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	64	42	66%
SLO #4	29	22	76%

Table 13. Assessment of MATH 125 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	NA	NA	97%
SLO # 2	NA	NA	82%
SLO #3	NA	NA	79%

Comment: The table should include the actual number of students who were tested. The rates seem to be high for this course.

Table 14. Assessment of MATH 130 SLOs.

SLO	TESTED	PASSED	RATE
SLO # 2	96	75	78%
SLO #4	271	183	68%

Action Plan for SLO 4
A new textbook was adopted at the beginning of this cycle. The material for SLO 4 is covered at the end of the semester. Since Fall 2009 was the first use of this textbook, instructors were determining the pacing through this book for the first time in the fall. Hence, several instructors ended up rushing the pacing at the end of the semester where content for this SLO is covered. Note that in spring, the success rate for this SLO improved by 6%--enough to meet the achievement target. Three out of the 4 instructors teaching in the spring had taught the course the preceding fall as well. Increased familiarity with the text led to adjustments in pacing to allow for better coverage of material toward the end of the semester. We feel this is a good trend and do not consider that further action is required at this time.

Table 15. Assessment of MATH 135 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	126	70	56%
SLO # 2	84	34	40%

Action Plan for SLO 2
The five sections in Spring 2010 substantially undershot the target. Individual section success rates ranged from 25% to 61%. This SLO should be reassessed again in Fall 2010 to determine whether this data is anomalous.

Table 16. Assessment of MATH 140 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	47	30	64%
SLO # 2	47	28	60

Table 17. Assessment of MATH 150 SLOs.

SLO	TESTED	PASSED	RATE
SLO #2	104	71	68%
SLO #4	87	39	44.8%

Action Plan: We were close to our achievement target, so with a little extra effort we might meet the goals. We need to get the students more engaged with practice. Giving in class skill sheets with some reward for performing well on them might help. Having students practice in writing, or orally, immediately after a discussion or lecture helps to solidify the knowledge. Working collaboratively on the skill sheets would also enhance the learning process.

Table 18. Assessment of MATH 160 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	58	43	74%
SLO #2	54	40	74%
SLO #3	52	34	65%
SLO #4	51	41	80%

Action Plan: None needed for SLO's 1, 2, 4. None defined for SLO #3

Table 19. Assessment of MATH 220 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	38	16	41%
SLO #2	36	18	50%
SLO #3	33	26	79%

Action Plan: The first SLO was assessed using problems on the first Chapter Test. The second Chapter Test was used as the assessment tool for SLO #2. Early in the semester there are students in the class who are not prepared for the course and will eventually withdraw. That is one reason the success rate is so low for the first two SLO's. MATH 220 is a very abstract course. There is a period of adjustment at the beginning of the semester, during which the students are very unsettled in the abstract environment. It takes them a while to regain their confidence. Testing the SLO's near the end of the semester might provide a more realistic picture.

Table 20. Assessment of MATH 230 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	56	38	68%
SLO #2	57	45	79%
SLO #3	32	27	84%
SLO #4	51	41	80%
SLO #5	57	51	89%

Action Plan: The first Chapter Test was used as the assessment tool for SLO #1. The failure rate in SLO #1 may be in part due to the lack of ability in the students to read sophisticated math. They have succeeded in previous courses without doing much technical reading. So their first

introduction to a more rigorous presentation, as in a differential equations book, is a shock. A goal might be for an instructor to slow down the introduction to this "new world" of real math. Take a little more time with the initial chapters and make sure the students are fairly secure with the new notation before expecting them to take a test (and before assessing an SLO). More time must be spent in getting students to ask questions immediately and in addressing their questions in class. An experienced instructor should anticipate the majority of questions and prepare examples to cover the stumbling blocks that generally arise.

Table 21. Assessment of MATH 250 SLOs.

SLO	TESTED	PASSED	RATE
SLO #1	60	48	80%
SLO #2	60	47	78%
SLO #3	60	36	60%
SLO #4	60	54	90%
SLO #5	60	43	72%

Comments: In MATH 250 the ratings improved in all five SLO's between fall 2009 and spring, 2010. Goals were met in four out of five SLO's. SLO 3 did not achieve its goals, with a combined pass rate of 60%. Instructors should give more time to question/answer sessions for the students when covering the topics in SLO #3.

The Mathematics Department is planning to develop Program Learning Outcomes (PLOs) during the 2010-11 academic year.

Area 7 Collaboration With Other Programs

1. The Mathematics department collaborates with various other departments. Science and Engineering departments are a part of the same division and the mathematics courses are aligned so as to be proper pre-requisites and co-requisites of science and engineering courses
2. The Mathematics department collaborates extensively with the Learning Center. Many of the tutors there have taken mathematics classes and tutor math. Some of the staff at the Learning Center teach mathematics classes, so they are familiar with the mathematics content, alignment of courses and student needs.
3. The Mathematics department offers courses with In-Class tutors who are trained by the Learning Center staff. This requires a great deal of collaboration between the instructors teaching those courses and the staff of the Learning Center. Finding the right tutors, scheduling the classes with in-class tutors, finding funds, and paying the tutors are some examples of work that requires extensive collaboration.
4. The Math Department collaborates with Instructional Resources center on campus. Making sure that classrooms are properly equipped and that students and faculty have

what they need for successful learning involves feedback to the Instructional Resource center on campus. This is again an example of constructive collaboration with student success as the ultimate goal.

Area 8 Outreach Activities

Discuss any activities or projects undertaken with other educational institutions, the community, or business/industry. Describe any plans to begin new outreach activities.

The Mathematics Department at AVC is currently is involved in various community outreach activities. Among these are Mathematics Field Day, Bohn-Meyer Math and Science Odyssey, and High School PAWs.

Since 1980 the Mathematics Field Day has been providing local high school students in the Antelope Valley the opportunity to participate in math contests held at the Antelope Valley College. There are approximately 15 schools and 75 students who participate each year. The contest consists of a 90-minute junior-senior competition in which each school enters a team of three students. There is also an 82-minute freshman-sophomore competition, in which each school enters a team of two students. After the competition, lunch is served and awards are presented. Mathematics Field day helps recognize mathematical ability among high school students and provides the opportunity for the community to participate.

In the Math Odyssey Day, the middle school students from the participating schools in the Antelope Valley are invited to a series of workshops conducted by the Antelope Valley College faculty, local professionals in Mathematics, Science and Engineering related fields. The students are able to participate in themed contest where they have the opportunity to design and create a project. Workshops are also provided for the middle school teachers. A keynote speaker also provides a presentation of the year's theme followed by lunch and award ceremony. In 2010 Antelope Valley College did not host the Math Odyssey Day. The event's future remains uncertain.

High School PAWs followed its sister program AVC-PAWs in April 2010. AVC-PAWs (Pre-Assessment Workshops) was initiated at Antelope Valley College in November 2009. It is a series of pre-collegiate level computerized math tests intended for freshmen students to refresh their math skills before taking an assessment math test. The software used in this program will grade, diagnose, and then provide links to appropriate tutorial and lecture notes. Mathematics Department, through its extended connection with high school representatives and counselors, was able to implement the program in five high school sites. This implementation was made possible by Educo-International Inc. co-operation and both MSEIP and Title V grants. The program was installed in each high school lab and identified students, those who had been placed in Arithmetic or Pre-Algebra after their first college assessment test, were registered in the system. The objective of the program is to help high school seniors to be placed in the appropriate math course upon their enrollment at college and hence saving both students and the college money and time.

AVC continues its effort to reach more high schools and offer its service to larger high school students. The implementation of this initiative has also resulted in considerable dialogues among our math faculty and high school math teachers. The second round of High School PAWs for the academic year 2010-11 started in October 2010.

In November 2010, the Mathematics Department hosted a two-day workshop in Mathematica. Over 25 professors from 11 colleges participated in this event.

Area 9 Goals and Objectives

Goal: Update the Course Outlines of Record (COR) and Student Learning Outcomes (SLOs) for all courses.

Objectives: A review of the COR and SLOs will be performed. Committees will be formed to review each course and amend the COR and SLOs as necessary. This includes making sure that SLOs reflect the current COR and, if necessary, amend the method of measuring SLO success. The success rates for each SLO will then be reported by the committee Chair to the Institutional Research and Planning Department using WEAVE.

Time Frame: The COR and SLOs of each course will be reviewed annually by each of the committees.

Justification: This goal will ensure that all courses are being taught based on a set of defined objectives that are measurable. This will assure that Antelope Valley College provides the latest and highest standards to all students, and that student success in each course is equitable regardless of the assigned instructor.

Goal: Improve student course placement.

Objectives: In collaboration with the Assessment Center, increase student placement accuracy and raise awareness of the assessment test for incoming college students. PAWS (Pre-Assessment Workshops) will also be revisited and improved as necessary to increase student placement scores and matriculation flow.

Time Frame: The data will be analyzed annually and discussed during department meetings.

Justification: Student placement will improve matriculation and help students pursue and achieve their educational goals more effectively.

Goal: Adapt a transfer model curriculum that includes the implementation of SB1440.

Objectives: Review and revise all math course descriptors to align them with the statewide C-ID system. Required courses for the new Associate Degree for Transfer will be identified and a

degree proposal will be written and submitted to AP&P. Faculty will also collaborate with the counseling department to help provide a clear pathway of transfer to a four year degree program, while earning an Associate Degree for Transfer.

Time frame: The model will be analyzed annually during department meetings and discussed with counselors as appropriate.

Justification: This will help our students by allowing them to take advantage of the admission priorities outlined in the SB 1440.

Area 10 Long Term Resource Planning (Updated annually)

If applicable, describe significant long-term resource needs that should be addressed in the next four years. The Educational Master Plan, student learning outcomes assessment reports, and data analysis may provide reference information to support your response. Use lists and tables to clarify program requests and make them easy for the Strategic Planning and Budget Council to review quickly. If there may be negative consequences for enrollment, safety or other important concerns if the funding is not provided please make this known in context.

10.1 List faculty and staff requirements to meet program needs in the next four years. Be specific and brief when offering a reason for the position (e.g. replacement, increased demand for subject, growth in student population). Mark the position as new or replacement. Place titles on list in order (rank) of importance.

As the budget crisis recedes, we will experience renewed growth and an increase in the number of math classes offered. It will be imperative that the college fill the four full time positions that have been vacated, without replacement, in recent years. The Math Division has sixteen full time faculty and thirty-eight adjunct instructors. The full time contingent comprises only 30% of the total. The ratio of full time to part time is 3 to 7. According to the Master Plan, as many as 5 retirements may be expected in the next three years.

The Math Division then anticipates the need for at least 4 and possibly as many as 8 or 9 replacement positions.

A significant increase in the student base is predicted for the next two or three years, generating a need for at least two new full time positions as well.

Table 22. Trends in enrollment over six semesters in the Division of Mathematics, Science and Engineering Fall 2006-Spring 2009.

Instructional Discipline	Semester AVG %	Semester Range %	Spring 2009 %	TRENDS
ASTR	3.2	2.8 – 3.5	3.2	no change
BIOL	25.5	23.3 – 28.6	23.3	down

CHEM	9.6	8.4 – 10.7	9.9	slightly upward
DRFT	0.5	0.2 – 0.7	0.6	slightly upward
ENGR	1.9	1.6 – 2.1	2.1	slightly upward
GEOG	4.8	4.4 – 5.2	4.4	slightly down
GEOL	2.1	1.6 – 2.5	2.5	slightly upward
MATH	48.2	45.3 – 50.1	50.1	upward
PHYS	2.1	2.1 – 2.2	2.1	no change
PSCI	2.1	1.7 – 2.6	1.7	slightly down
	Average	**Range**	**Spring 2009**	
FTES	1228.5	1084.1 – 1399.14	1343.57	Upward

Several programs in the planning stage would benefit from the creation of a second Math Computer Lab. One proposed program is the conversion of a portion of MATH 099's self-paced classes into a computer enhanced or online format. A self-contained web-based course management system like Educosoft would be used. Another lab technician would be needed to run such a lab.

In the very early stages of planning is another program that would require more lab space. There is a recommendation to discontinue MATH 050 as a college credit course. MATH 050 might instead be offered through Corporate and Community Education. The traditional MATH 050 classes would possibly be replaced by one large section run by one instructor, using a mostly online format. Students would be expected to spend some time on campus in the computer lab with a tutor. More student tutors would be needed as well as the lab technician.

1. Fill the 4 vacant mathematics teaching positions.
2. Fill the math vacancies that occur in the next few years due to retirements.
3. Computer lab technician/tutor for a new Math Computer Lab

10.2 List facilities (remodels, renovations or new), equipment and technology needed to provide a safe and appropriate environment for student learning in next four years. Place items on list in order (rank) of importance.

The new Health Sciences building, scheduled to open in August 2012, will have multiple computer labs, some designated for mathematics. There will certainly be a need for new lab technicians, skilled with the technology and in mathematics**.**

Mathematics faculty currently has offices in the T300 and BE buildings as well as OF1. The new Health Sciences building will have office space for the entire math faculty.

With continued enrollment pressure, due in part to the growth of the Antelope Valley population base, it is anticipated that a significant number of sections of mathematics will have to be scheduled at the Palmdale Center in coming years.

Many of the online courses taught in mathematics are hybrid courses requiring visits to the campus several times during the period of instruction. Because of space limitations on the Lancaster campus it is conceivable that the Palmdale Center could become a hub for hybrid online instruction.

An improved computer lab will be needed at that facility and a full time lab technician.

A survey of the student desks in the ME building (rooms 108, 109, 110, 111, and 114) showed that 44 have plastic seats and backs that are cracked or broken. Seven of these should be replaced now as they have jagged edges or broken pieces of plastic. Those that are damaged will continue to deteriorate and will need to be replaced in the coming years.

1. Replace broken student desks in the ME building.
2. Purchase the computers required for a new lab.
3. Replace old computers in faculty offices and ME 104.
4. Upgrade, on an annual basis, computer software: Maple, Mathematica, and MatLab.

10.3 Identify funding needed to support student learning.

Funding is needed for the items listed in sections 10.1 and 10.2 of this report. We should continue to seek grants to support our mission.

Area 11 Recommendations for Mathematics Science and Engineering

1. The Mathematics department should always strive to improve in any way it can to help our students. A large number of students place into Arithmetic. Some semesters we offer about 30 sections of Arithmetic and there seem to be even more sections required. A closer look at the placement tools is necessary. The question is "Are students being properly placed?"
2. If students are placing into low level courses because they forgot a few concepts, perhaps they could be allowed to review them. Workshops could be held throughout the semester for students to brush up and then take the placement test. This could result in fewer sections of Arithmetic. The ultimate goal is to see students succeed to higher math classes.
3. At this time the Mathematics faculty is scattered all over campus. This causes isolation and it would be better for faculty to be closer together, to not feel isolated. It would certainly improve camaraderie and the exchange of ideas which is crucial to our growth as teachers.
4. Computer technology, hardware and software, used in the faculty offices, classrooms and the math, science, CAD and engineering computer laboratories must be upgraded and maintained at an operational level that does not negatively impact instruction.

5. As soon as funding is available, the six vacant full-time faculty positions in mathematics, science and engineering must be filled. Moreover, very serious thought must be given to the creation of new full-time positions in chemistry, CAD, geography, water science, and physics.
6. Additional laboratory technicians are needed to support late-afternoon and evening plus weekend instruction in the chemistry and physics laboratories. At present no support is provided for the engineering laboratory. The 0.5 FTE grant funded biology technician must be converted to district funds to continue support of the evening and weekend biology laboratories and to mitigate possible district liabilities over animal maintenance.

Area 12 Executive Summary

Classes in the Mathematics, Science, and Engineering Division account for upto 24% of the instructional faculty LHE at Antelope Valley College. The numbers of sections taught in various disciplines and the numbers of student served are presented in the table below.

Discipline	**Sections***	**No. of students**	**FTES**
Astronomy	13	408	42.69
Biology	91	2734	313.03
Chemistry	26	534	133.54
Drafting	4	43	8.19
Engineering	10	178	28.59
Earth Science	1	18	3.73
Geography	20	595	59.79
Geology	9	319	33.37
Mathematics	176	5105	637.71
Physics	5	124	27.63
Physical Science	5	114	23.03

*data from Spring 2009, representative of typical semester"

Students can find traditional day schedule, night classes, Saturday classes, hybrid and online offerings among the 86 different lecture and laboratory classes taught by this division. At least one honors course is offered in every regular semester. Faculty offer honors options in many other science classes. The number of science courses offered at the Palmdale Center has increased significantly. Astronomy, Physical Science, Geology, and Chemistry (lecture only) are now available, in addition to Geography and Biology (lecture only).

This expansion in Palmdale was enabled by the Title V grant which funded lab equipment to establish a dry lab at the Center. Title V has supported several other projects within the division. The AVC Foundation and the Air Force Research Laboratory have also donated funds for essential equipment and supplies. Collaboration with the TYBRIN Corporation has led to internships through ENGR 199, Occupational Work Experience, for engineering students.

Curriculum changes since the previous program review include:

- Lectures, labs, and in some cases problem-solving sections, in biology, chemistry, and physics classes were combined into single courses. A single grade, considering student performance in lecture, lab, and problem-solving segments of the course, is assigned. This change was necessitated by increasingly interactive classes—more hands-on activities are incorporated into lectures, and more discussion is developed in laboratory and problem-solving classes.

- Additional courses are offered in online or hybrid format. PSCI 101 is no longer offered online because of the dramatic improvement documented in student success when a hands-on inquiry-based curriculum was adopted in the classroom.

- Courses in the water treatment program were converted from not-for-credit to for-credit courses.

Student Learning Outcomes have been approved for every course in the division. Assessment has begun. Analysis will be more conclusive with additional cycles of SLO data. Program Learning Outcomes are being developed for degrees and certificates offered by the division.

Faculty and students in the division depend most heavily on the resources of the Learning Center, IMC, Library, and ITS. A few subject areas report unresolved problems with ITS. Faculty in all subject areas agrees that a wireless network would enhance curricular activities.

Interactions by AVC mathematics faculty with the Math Coordinator and faculty of the AV Union High School District have been highly productive. These have included summer workshops to prepare students for AVC's math assessment test PAWS. And, a math course designed to help graduating seniors review high school math and be prepared for placement into a collegiate math course. Joint faculty professional developments, articulation of classes, and grant collaborations have also occurred.

In each subject area, more than 50% of LHE must be covered with overload or adjunct teaching. (Except biology, with 37%) The area with the most pressing need for a full-time time instructor is engineering and drafting—100% of courses are taught by part-time faculty. Community partners regularly report their need to hire engineers. A number of students at AVC express interest in becoming engineers. A strong engineering program would support the mission of AVC and benefit both constituents.

There is also an urgent need for a full-time instructor in geography. The demands of the five courses in the Geographic Information Systems certificate program in technology, student outreach, employer outreach, and industry trends are overwhelming and distinct from the demands of the seven other classes geared towards cultural geography.

While each subject area has specific goals, divisional goals include developing transfer degrees in accord with SB1440 guidelines and the Transfer Model Curricula developed for each

discipline. For existing degrees, articulation will be the focus. New degrees in chemistry and environmental sciences require development of new courses.

The division is excited to occupy the new Health and Science Building in summer 2012. Expansion of course offerings, increased collaboration among faculty of specific subject areas and improved interaction between subject areas are some anticipated benefits.