



# Chemistry Program Review



## 2004-05

*Prepared for*  
Citrus Community College District

*Prepared by*  
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**Staff of Division of Science, Engineering, and Health Sciences**

# Citrus College

## **CHEMISTRY PROGRAM REVIEW COMMITTEE MEMBERS 2004-2005**

Full Time Chemistry Faculty:

Julie Lowe  
Terry Miles  
Dave Ryba

Chair:	Terry Damron, Dean
Vice President of Instruction:	Jim Williams
Academic Senate Representative:	Marilyn Eng (Dennis Korn, substitute)
Articulation Officer:	Jeanne Howard
Curriculum Committee Representative:	Pat Lawrence
Dean of Counseling:	Lucinda Over
Librarian:	John Thompson
Research and Planning:	Bill McCusker
Support Staff:	Lillian La Spina and Christine Pagano

## FACULTY

### FULL-TIME FACULTY:

Julie Lowe  
Terry Miles  
Dave Ryba

### ADJUNCT FACULTY:

Robert Montgomery  
Badieh Sadri

## LIST OF CERTIFICATES/AWARDS OFFERED

Chemistry has no certificates or awards of completion

## CHEMISTRY PROGRAM (Course Inventory)

	<u>UNITS</u>
CHEM 095 Pre-Collegiate Science Methodology	3
CHEM 100 Chemistry for Daily Life	4
CHEM 103 College Chemistry	5
CHEM 104 College Chemistry	5
CHEM 110 Beginning Chemistry	5
CHEM 111 General Chemistry	5
CHEM 112 General Chemistry	5
CHEM 114 Chemical Principles	5
CHEM 115 Chemical Principles	5
CHEM 210 Organic Chemistry	3
CHEM 211 Organic Chemistry Lab	1
CHEM 220 Organic Chemistry	3
CHEM 221 Organic Chemistry Lab	1

## **Institutional General Education Competencies- Part of Institutional Mission**

General education competencies serve as a common set of core curricular components identified and defined by faculty. Student learning outcomes are behaviors based on these competencies.

Any student transferring, completing a degree or certificates from Citrus College, must demonstrate effectively assessed awareness, understanding, knowledge, skills, and abilities in the selected competencies.

### 1. Communication (personal expression and information acquisition)

#### Examples

Reading analytically and critically  
Writing with clarity and fluency

Speaking articulately  
Listening actively

### 2. Computation

#### Examples

Technology  
Math proficiency  
Analyzing and using numerical data  
Application of mathematical concepts and reasoning in data analysis

Computer proficiency  
Decision analysis  
(Synthesis and evaluation)  
Application of mathematical concepts and reasoning in data analysis

### 3. Creative, Critical, and Analytical Thinking

#### Examples

Curiosity  
Analysis  
Synthesis  
Evaluation  
Creativity

Research  
Learning Strategies  
Problem Solving  
Decision making  
Aesthetic awareness

### 4. Community, Critical, and Analytical Thinking

#### Examples

Respect for others beings  
Cultural awareness  
Ethics  
Community service  
Integrity

Citizenship  
Interpersonal skills  
Lifelong learning  
Self esteem  
Empathy

### 5. Technology/information competency

#### Examples

Basic computing and word processing  
Capacity to use scientific software for data acquisition and analysis

6. Discipline/subject Area Specific Content Material – Course Outlines of Record detail specific outcomes objectives for each content area.

## **Program Description**

The two-year program in chemistry provides the student with a broad background in inorganic and organic chemistry and quantitative analysis. The program addresses both general education, as well as the needs of science and engineering majors, as well as those of students in the allied health areas.

## **Program Objectives:**

The courses in this program serve three distinct populations, each with a different set of overall objectives and outcomes expectations. The courses in each of the three separate areas address the core institutional competencies: oral and written communication, computation, creative and analytical thought, global and community consciousness, and technology. The degree to which each of these competencies is emphasized varies according to the needs of the respective student population.

It is appropriate to say that all students in the program must develop and employ the ability to read and analyze information, synthesize information and reach logical conclusions, effectively communicate their results, and utilize the necessary computational skills to effectively conduct a scientific exercise or experiment and reach a desired end. The students in the Chemistry Program will utilize a number of scientific instruments to acquire and analyze data and render the data in the form of a word-processed report or final written report.

## **Program Student Learning Outcomes:**

Because the courses in the Chemistry Program service different student needs as defined in the previous section on Program Objectives, the learning outcomes will generally address the core institutional competencies with emphasis on specific competencies as defined in the Course Outline of Record for each of the courses in the Program.

## **Chemistry Program Goals:**

- Provide science and engineering transfer credit to four-year colleges and universities.
- Meet the student learning outcomes and core competencies institutionalized by Citrus College.
- Using experimental models, courses in the Program will provide students with a basic understanding of general scientific concepts and specific chemical principles.
- Prepare students to receive specific training in allied health programs such as nursing and physician's assistance.
- Provide general education courses for students with either Associate Degree and/or transfer goals.
- Provide classes that serve as prerequisites for other program areas on campus, especially those with a heavy emphasis on science and mathematics, i.e. engineering and pre-med.

Specific Student Learning Outcomes (SLO) are detailed in the Course Outline of Record for each Chemistry course .[Course Outlines of Record appended to this document]

The Chemistry Faculty in the Physical Science Department have scheduled one-third of their courses to undergo curriculum review and upgrade each year, including the insertion of specific language for outcomes assessment, refinement of overall assessment practice, and appropriate content changes in each course. The expectation is that the process will be completed by the end of the 2006-2007 academic year, if not before.

All new courses will be reviewed for compliance with current Curriculum Committee standards prior to submission for review and approval.

## **Mission**

### *Commendations:*

- The program conforms to the District's mission statement to provide transfer and degree courses.
- Course numbering follows a logical pattern.
- Prerequisites are consistent with our transfer institutions.
- Student population in chemistry reflects District's diversity.
- Curriculum reflects that of transfer institutions.—see Need/Articulation Agreements
- Course syllabi meet institutional standards. (see Quality/learning outcomes assessment language)
- The Physical Science department faculty has experimented with some integration with the water treatment and cosmetology programs.

### **[Recommendation 1998-99]**

- Currently no local industry demand for a joint effort with the Biology Department to develop technical certification in biotechnology.
- Introductory paragraph of Chemistry section in the college catalog was revised. **[Recommendation 1998-99]**
- Science Department faculty have used local industrial and municipal sites for practical on-site observations of chemistry in the community setting.

### **[Recommendation 1998-99]**

### *Recommendations:*

- Course outlines of record for all Chemistry courses are being revised and targeted to have all courses updated to include student learning outcomes language by the end of the Fall Semester 2006.
- Organic Chemistry should be revised to a 5 unit course with 3 hours lecture, 1 hour of discussion, and 3 hours of laboratory.
- Revise the description of Chem 103 & 104; "College Chemistry" to "Allied Health" or "Life Science Chemistry".
- Evaluate nursing or allied-health chemistry for appropriate pre-requisites and the impact of changing to a 5-unit combined Chem 103/104 course.

## **Need**

### *Commendations:*

- Courses are offered in a manner that allows students to finish the program in two years.
- Prerequisites are consistent with our transfer institutions, although the need for different math prerequisites on Chem 103 and 104 should be evaluated.
- The curriculum reflects that of transfer institutions.
- A “Success in Science” interdisciplinary course was developed and offered to assist students struggling in science classes. [**Recommendation 1998-99**]
- Will offer a “Consumer Chemistry” course for non-science majors in the fall of 2005. [**Recommendation 1998-99**]
- Chemistry 110 is currently scheduled as both a day and an evening course. From current student enrollment patterns, there does not appear to be a similar evening audience for Chemistry 111 & 112 at this time. [**Recommendation 1998-99**]
- Several deficient safety features on the second floor of the PS building were identified and corrected; some concerns still remain, particularly the pooling water on the stairs because of traction strip design and the air changeover rates in the chemistry labs. [**Recommendation 1998-99**]
- Implemented print limits on computer labs to regulate amount of printing in the computer lab. [**Recommendation 1998-99**] Improvement but still large print runs do occur.
- A joint working group developed the Science for Educators series (3 courses) in a collaborative process that included members of Chemistry Faculty. CHEM 106/PHYS 106 (same course—cross listed) was a of this effort and will be offered for the first time in the fall of 2005. The courses in this series are in response to the revised State competency standards for Multiple Subject (Elementary) Teaching Credentials.
- During the period of this Program Review, the program has grown from approximately 110 FTEs per academic year to approximately 143 FTEs (for the last full year reported—2003-2004).
- Chemistry has high operating expenses and tends to close the year with either a modest revenue surplus or deficit. Overflow non-credit hours from hours arranged on courses adds significant revenue--\$32,000 approx. based upon 18 FTEs @ 2/3 of credit revenue amount-- that does not appear in the cost center budget report.

### *Recommendations:*

- Web pages for the discipline should be upgraded and “hit counters” should be employed to determine the degree to which they are accessed.
- Chemistry faculty should determine if there is a way to restrict access to the success in science course so that it serves its intended purpose as a safety net for students struggling in introductory science courses?
- Evaluate the impact of the Chem/Phys 106 offerings on enrollments in Chem 110 .



- Continue to develop web pages for classes and specific instructors. It would be helpful to have more district support for web page design and maintenance. There is a large need to have “hit counters” something that MIS has said would be difficult to provide under our current structure.
- Need tracking information on Citrus graduates in order to follow their progress.
- Need to develop a security system for record keeping insuring integrity of student work.
- Should evaluate the possibility of offering a summer GATE program for area elementary districts.
- Should Citrus consider hosting a science fair for area high schools similar to successful programs like that at Fullerton College?
- Work with the counseling staff to develop academic “roadmaps” for students who will major in some aspect of science. Attend counseling department meetings in order to ensure that the counseling staff fully understands the appropriateness of specific chemistry courses for selected students.
- Consider using Chemistry 100 as a vehicle to focus a discussion among science faculty about the need for some minimal math competency for any general education science course.
- Evaluate grant opportunities that might provide opportunities for program enhancement or that can serve as a means to provide outreach to our educational partners.

## **Quality**

### *Commendations:*

- Courses articulate with those at UC and CSU campuses.
- The faculty have developed grading standards, critical thinking methodologies, problem solving and written assignments consistent with college-level work.
- The faculty attends conferences and in-service functions regularly.
- All full-time faculty have undergone Meyers-Briggs testing program, student testing has not occurred due to budget constraints and lack of staff in Student Services. [**Recommendation 1998-99**]
- Labs have state-of-the-art computer and safety equipment for student use.
- Faculty members have applied for and received foundation grants to fund the purchase of media equipment for the department.
- A plan for the rotation of faculty in course sequence was implemented. The rotation identified faculty strengths and current assignments reflect the pairing of faculty strengths with the appropriate course(s). [**Recommendation 1998-99**]
- To the extent possible, laboratories incorporate modern technology in the acquisition and analysis of data. [**Recommendation 1998-99**]
- The Chemistry faculty does not see a current need for an “Instrumental Analysis” course/seminar since there does not appear to be a local industry and/or municipal need for laboratory training. [**Recommendation 1998-99**]
- Evaluate the formation of an advisory board from local industries to gain knowledge of their needs for potential vocational education program. No action taken since industries of this type have **not** been identified within the District and Mt. San Antonio College has implemented a regionally approved chemical technician training program[**Recommendation 1998-99**]
- The Chemistry faculty has met with the Curriculum Committee Chairperson and has initiated the process of bringing all of the Course Outlines of Record into compliance with the need for learning outcomes assessment language.

### *Recommendations:*

- Consider restricting software access to campus-only computer labs in order to improve the effectiveness of arranged hours for chemistry courses. [**Recommendation—improve effectiveness-- 1998-99**]
- Increase the awareness of other Community Colleges and their programs. [**Recommendation 1998-99**] Plans are underway to have a fall 2005 meeting for area community college chemistry faculty.
- Make the ACS exam a more significant part of the final exam in Chemistry 110, 111, and 112.
- Reevaluate the ACS general chemistry format and possibly incorporate it into our program.

- Evaluate the need for mathematics prerequisites for Chemistry 103 and 104 (Nursing Chemistry) and whether a combined 103/104 class would serve student needs or limit their options.
- Increase collaboration with the chemistry faculty from area CSU campuses.
- Complete the addition of student learning outcome assessment language to all chemistry courses.
- Develop a plan to test the effectiveness of student interactive devices (“clickers”) in chemistry lecture courses.
- Be proactive in obtaining student internships from JPL.
- Devise a plan for updating Course Outlines of Record in a timely fashion to keep the information on textbooks and the student learning outcomes expectations current.

## **Feasibility**

### *Commendations:*

- The Chemistry faculty members are among campus leaders in incorporating technology into their instructional program.
- The department uses computer applications in traditional chemistry labs.
- Faculty members have applied for and received foundation grants to fund the purchase of media equipment for the department.
- Security in PS building has been reevaluated and stockroom security has been enhanced. [**Recommendation 1998-99**]
- Added staffing for multimedia/technical support has made technology more reliable for the instructional program. A multimedia/technical specialist for web support, or a reordering of priorities for existing staff would make it easier to have sites for instructors. [**Recommendation 1998-99**]
- Subscribed to electronic access for the Journal Science. This proved to be cumbersome and not user friendly and the library staff has discontinued the circulation of *Science*. Coupled with expense, the lack of ease of use led to cancellation of online subscription. The division office will make arrangements to obtain *Science* at a more economical rate than the institutional subscription price. [**Recommendation 1998-99**]
- Computer tutorials are available --ChemNet, Interactive Chem (online access included)—have been added to assist students. [**Recommendation 1998-99**] and restricting their access to campus-only use is under discussion.
- Evaluated the need for student help in the stockroom. [**Recommendation 1998-99**] Mary Madison, Chemistry Lab Technician, states that based upon prior experience she does not feel that student help reliability is a major issue.

### *Recommendation:*

- Reevaluate safety features for labs and stockroom (i.e. showers, doors) and air turnover rates and develop consistent guidelines for safety procedures in the laboratory.

## **Compliance**

### *Commendations:*

- Access has been significantly improved for students with disabilities, as a result of course restructuring and the remodeling of the physical facilities, especially the laboratories.