TO: The Academic Senate
FROM: The Committee on Academic Planning Review (CAPR)
SUBJECT: 18-19 CAPR 14: CAPR analysis of Chemistry and Biochemistry 5-year program review
PURPOSE: For Action by the Academic Senate
ACTION REQUESTED: Acceptance of the Five-Year Program Review of the Department of Chemistry and Biochemistry; it is recommended that the program continues without modification.

BACKGROUND: At its meeting on February 21, 2019, CAPR members unanimously approved the Chemistry/Biochemistry 5-year program review. This approval was based on conversations with the lead writer of the report and Dr. Michael Moore, the CAPR liaison. The summary document provided was reviewed and approved by the Chair of the Department of Chemistry/ Biochemistry. The summary of the five-year review is attached to this memo. It is recommended that the program continues without modification.

Following approval of this memo by the Senate, the Provost will review the summary and meet with members of the Department of Chemistry and Biochemistry and the CAPR chair at a time mutually agreeable during the Spring 2019 term to devise a clear 5-year plan moving forward. The Provost will then create a Memorandum of Understanding (MOU) with the Department of Chemistry and Biochemistry and return that MOU to the Senate as an information item as soon as possible (completion of a MOU may require extension into the following Fall semester given scheduling timelines).
1.0 BACKGROUND

Program

The Department of Chemistry and Biochemistry includes seven undergraduate programs and one graduate program. The five-year review includes all eight degree programs following the CAPR format for academic programs without external accreditation.

The list of degree programs offered by the department is as follows:

• B.S. in Chemistry
• B.S. in Chemistry, Forensic Science Option
• B.S. in Biochemistry
• B.A. in Chemistry
• B.A. in Biochemistry
• B.A. in Chemistry, Chemistry Education Option
• B.A. in Biochemistry, Chemistry Education Option
• M.S. in Chemistry

Students

• The number of majors in the department has remained level since the last five year review. As of Fall 2006, there were 250 students enrolled, 218 of whom were undergraduates and 32 of which were graduate students
• As of Fall 2016, 90% the students majoring in biochemistry were full time, and 92% of undergraduate chemistry majors were full time
• In the 2016-17 academic year, 44% of students were native CSUEB students, and 56% were transfer students
• 4-year graduation rates for freshmen ranged from 14% to 42% for biochemistry majors and from 6% to 17% for chemistry majors
• 6-year graduation rates for freshmen ranged from 50% to 62% for biochemistry majors and from 33% to 50% for chemistry majors
• 2-year graduation rates for Transfer students ranged from 17% to 50% for biochemistry majors and from 0% to 33% for chemistry majors
• 4-year graduation rates for transfer students ranged from 50% to 62% for biochemistry majors and from 50% to 71% for chemistry majors
• Student demographics in the department are diverse, with up to 50% undergraduate majors identifying as Asian, 24% Hispanic, and 12% Black. Between 46% and 65% of students over the past five years identified as female, and 35%-54% as male.

Faculty
The department currently consists of eleven tenure track faculty members, two of which are new as of Fall 2018. This is five more than in the previous five year review. The number of part time lecturers has varied from eleven to sixteen. The department has had some challenges in improving the percentage of FTES taught by tenured or tenure track faculty members, with FTES ranging from 55% to 66.7%. The department expects this number to improve with the addition of the two new tenure track faculty this year. As of May 2018 the demographics for tenure track faculty were as follows: six members identified as White, two members identified as Asian, and one member identified as Other. During the time since the previous five-year review, the faculty has roughly maintained a 1:1 gender ratio. Since the previous five-year review, the faculty in the department have collectively published 23 articles and been awarded a 38 grants. Faculty also supervised the research projects of approximately 60 undergraduate students and 35 graduate students over the past five years.

1.2 OVERVIEW OF THE DOCUMENTS SUBMITTED

- Self-Study and 5-Year Plan approved by faculty
- External Reviewer Report received by the program
- Program’s Response to External Reviewer’s Report
- 5-Year Plan Amended

2.0 CAPR’s ANALYSIS

a. Faculty

Since the previous five-year plan, the department successfully hired several new faculty members, including a physical chemist, an inorganic chemist, an analytical chemist, and two biochemists. An additional physical chemist position was approved to begin in the 2018-19 year. The department anticipates changing needs in the coming years and will develop a plan for hiring tenure track faculty that maintains balance among the sub-disciplines of chemistry and takes into account the major courses that need to be taught by tenure track faculty.

The department is working to increase the number of courses taught by tenured or tenure-track faculty, and plans to submit requests for several additional faculty.

- Total FTEF have remained constant
- Total FTES has increased slightly
- Overall SFR has remained constant
- Number of course sections offered and average section size remained constant

b. Student Advising, Retention, and Mentoring

Each undergraduate student is assigned to one of the department’s full time faculty, who serves as their advisor throughout the student’s time in the department. In addition, the department notes that it has plans to increase its coordination with the College of Science
Student Service Center to ensure that students are fully aware of all program
requirements and to develop an individualized plan to meet them. The department also
noted in the review that it has plans to meet regularly with GE representatives to ensure
that lower-division students consistently take the right courses and prerequisites.

The department has developed several strategies to improve graduation rates, as part of
the university’s Graduation Initiative. This includes improvements to the department’s
website to make it easier for students to access roadmaps, advisor information, student
organizations, etc. At the graduate level, in addition to assigning each graduate student to
a faculty mentor, the department’s graduate coordinator will meet regularly with students
to ensure that each student is making consistent progress towards their degree. As the
M.S. program has undergone significant changes as a result of semester conversion, the
department is particularly mindful of the importance of this.

The department actively encourages its students to become involved in the research
projects of faculty members, and coordinates its efforts with the Center for Student
Research to help students explore funding opportunities. As noted above, department
faculty have supervised approximately 60 undergraduate students and 35 graduate
students on research projects over the past five years.

\[c. \text{ Curriculum and Program Changes}\]

Since the previous five-year plan, the department has made several changes to the
curriculum in order to update and improve it. The department points out that a significant
amount of their time and energy were devoted to the task of semester conversion, and that
this was not foreseen in the previous five-year plan.

- The total number of units for three of the degree programs was reduced in order to
  comply with the 180-unit maximum requirement: B.S. Chemistry, B.S.
  Chemistry-Option in Forensic Science, and B.S. Biochemistry.
- Chem 1100 “Introduction to College Chemistry” was revised to become part of
  the “Teaching in the 21st Century” cluster aimed at Liberal Studies majors.
- Lab curriculum throughout the department was revised to include new
  experiments to make use of new techniques and instruments (see resources
  section below).

Under semester conversion, all chemistry and biochemistry programs have been
restructured.

- All of the degree programs have increased math requirements
- The Master’s degree program has been redesigned to include concentration tracks
  in chemistry and in biochemistry, including a core curriculum of courses in
  organic chemistry, physical chemistry, analytical chemistry, and biochemistry
- Concentrations in the Master’s program are distinguished through elective courses
Three new 600-level core courses and two new 600-level electives were developed.

Over the next five years, the department plans to strengthen its curriculum and to foster student engagement in the department. Department faculty will continue to involve students in hands-on research projects, working with them to develop not just research skills, but also professional communication skills through research presentations. The department will initiate research projects in new student fora designed to foster student-student interaction on those projects and to include students not otherwise engaged in research due to time constraints or other out-of-class responsibilities. In particular, the department plans to:

- Revise the prerequisites for introductory courses
- Increase the number undergraduate biochemistry and chemistry courses taught by tenured or tenure track faculty
- Further upgrade laboratory curriculum
- Further upgrade instrumentation
- Develop a department policy to standardize lab mechanisms for student safety training and waste handling in research labs
- Establish forums for sharing student research activities
- Develop new service courses for the Engineering Department and the Earth and Environmental Science Department
- Develop two new general education courses that also meet the sustainability overlay requirement
- Develop two new graduate-level courses
- Increase the number of graduate students through a greater emphasis on recruitment

d. Assessment

All programs within the department have five program learning outcomes (PLOs) that are directly mapped to the relevant institutional learning outcomes (ILOs). The department conducts an assessment of a particular PLO every year. In addition, the department assesses PLOs 1 and 2 annually (PLO 1 = demonstrate knowledge in the various areas of chemistry, including inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry and biochemistry; PLO2 = work effectively and safely in a laboratory environment to perform experimental procedures and operate modern chemical/biochemical instruments).

The results of the assessment showed that students mastered most of the learning objectives, however the department identified the PLO on quantitative reasoning to be the most problematic. The department plans to institute several changes to the program in order to address the issue:
Increasing the number of math classes taken by students in all of the undergraduate programs

- BS chemists and biochemists will take a calculus-based physics series.
- BA chemists and biochemists will have the choice between calculus- and algebra- based physics series.

Resources

Since the previous five year plan, the department has acquired and/or updated a variety of equipment.

- The department obtained an Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES)
- The department obtained a new High Performance Liquid Chromatography Instrument (HPLC) with fluorescence detection
- The department obtained a variety of equipment for organic chemistry laboratories, including
  - Microwave synthesizers
  - Infra-red spectrometers
  - Gas chromatographs
  - Digital melt stations
- The department updated its physical chemistry labs with improved emission spectrometers, conductivity probes, and gas sensor probes
- The department upgraded a spectrofluorimeter to include a stopped-flow attachment
- The department obtained a multi-channel probe for the NMR.

The department was able to hire a new Instructional Support Technician to replace a previous technician

The department hired a new administrative assistant to replace a previous administrative assistant

The department hired a part time purchasing staffer to replace a previous ASA II

Research lab space and office space will be needed for new faculty hires

The department plans to hire an equipment and stockroom manager to replace a position which had previously been eliminated, as the absence of this position has negatively impacted the ability of the department to maintain and update the department’s instrumentation and to improve the laboratory curriculum

Recommendations
The five-year report submitted by the Department of Chemistry and Biochemistry is exceptionally detailed and thorough. After careful review of the 5-year plan, the external viewer’s report and the program’s response to the external reviewer’s report, CAPR recommends that the department emphasizes its plans to hire additional tenure track faculty, keeping in mind faculty diversity as well as ACS certification requirements. The department has made progress in hiring several new faculty; however, the percentage of course sections taught by tenure track faculty remains an issue of concern. In addition, CAPR recommends continuing to work with the College of Science to cultivate support for lab coordination and mentoring student research.

CAPR recommends the continuation of the Chemistry and Biochemistry programs without modification.

The next 5-year review is to be completed in the Spring of 2022-2023 academic year.