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COMMITTEE ON ACADEMIC PLANNING AND REVIEW

18-19 CAPR 14
Thursday, February 21, 2019

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.

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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).

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1 **CAPR Summary of 5-year review; Biochemistry/ Chemistry**

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3 **1.0 BACKGROUND**

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5 *Program*

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

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

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 - 14 • B.S. in Chemistry
 - 15 • B.S. in Chemistry, Forensic Science Option
 - 16 • B.S. in Biochemistry
 - 17 • B.A. in Chemistry
 - 18 • B.A. in Biochemistry
 - 19 • B.A. in Chemistry, Chemistry Education Option
 - 20 • B.A. in Biochemistry, Chemistry Education Option
 - 21 • M.S. in Chemistry

22 *Students*

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 - 25 • The number of majors in the department has remained level since the last five
26 year review. As of Fall 2006, there were 250 students enrolled, 218 of whom
27 were undergraduates and 32 of which were graduate students
 - 28 • As of Fall 2016, 90% the students majoring in biochemistry were full time, and
29 92% of undergraduate chemistry majors were full time
 - 30 • In the 2016-17 academic year, 44% of students were native CSUEB students, and
31 56% were transfer students
 - 32 • 4-year graduation rates for freshmen ranged from 14% to 42% for biochemistry
33 majors and from 6% to 17% for chemistry majors
 - 34 • 6-year graduation rates for freshmen ranged from 50% to 62% for biochemistry
35 majors and from 33% to 50% for chemistry majors
 - 36 • 2-year graduation rates for Transfer students ranged from 17% to 50% for
37 biochemistry majors and from 0% to 33% for chemistry majors
 - 38 • 4-year graduation rates for transfer students ranged from 50% to 62% for
39 biochemistry majors and from 50% to 71% for chemistry majors
 - 40 • Student demographics in the department are diverse, with up to 50%
41 undergraduate majors identifying as Asian, 24% Hispanic, and 12% Black.
42 Between 46% and 65% of students over the past five years identified as female,
43 and 35%-54% as male.

44 *Faculty*

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

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60 **1.2 OVERVIEW OF THE DOCUMENTS SUBMITTED**

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- 62 • Self-Study and 5-Year Plan approved by faculty
- 63 • External Reviewer Report received by the program
- 64 • Program's Response to External Reviewer's Report
- 65 • 5-Year Plan Amended

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67 **2.0 CAPR's ANALYSIS**

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69 *a. Faculty*

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71 Since the previous five-year plan, the department successfully hired several new faculty
72 members, including a physical chemist, an inorganic chemist, an analytical chemist, and
73 two biochemists. An additional physical chemist position was approved to begin in the
74 2018-19 year. The department anticipates changing needs in the coming years and will
75 develop a plan for hiring tenure track faculty that maintains balance among the sub-
76 disciplines of chemistry and takes into account the major courses that need to be taught
77 by tenure track faculty.

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

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

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87 *b. Student Advising, Retention, and Mentoring*

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89 Each undergraduate student is assigned to one of the department's full time faculty, who
90 serves as their advisor throughout the student's time in the department. In addition, the
91 department notes that it has plans to increase its coordination with the College of Science

92 Student Service Center to ensure that students are fully aware of all program
93 requirements and to develop an individualized plan to meet them. The department also
94 noted in the review that it has plans to meet regularly with GE representatives to ensure
95 that lower-division students consistently take the right courses and prerequisites.

96
97 The department has developed several strategies to improve graduation rates, as part of
98 the university's Graduation Initiative. This includes improvements to the department's
99 website to make it easier for students to access roadmaps, advisor information, student
100 organizations, etc. At the graduate level, in addition to assigning each graduate student to
101 a faculty mentor, the department's graduate coordinator will meet regularly with students
102 to ensure that each student is making consistent progress towards their degree. As the
103 M.S. program has undergone significant changes as a result of semester conversion, the
104 department is particularly mindful of the importance of this.

105
106 The department actively encourages its students to become involved in the research
107 projects of faculty members, and coordinates its efforts with the Center for Student
108 Research to help students explore funding opportunities. As noted above, department
109 faculty have supervised approximately 60 undergraduate students and 35 graduate
110 students on research projects over the past five years.

111 112 *c. Curriculum and Program Changes*

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

- 118
119 • The total number of units for three of the degree programs was reduced in order to
120 comply with the 180-unit maximum requirement: B.S. Chemistry, B.S.
121 Chemistry-Option in Forensic Science, and B.S. Biochemistry.
- 122 • Chem 1100 "Introduction to College Chemistry" was revised to become part of
123 the "Teaching in the 21st Century" cluster aimed at Liberal Studies majors.
- 124 • Lab curriculum throughout the department was revised to include new
125 experiments to make use of new techniques and instruments (see resources
126 section below).

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128
129 Under semester conversion, all chemistry and biochemistry programs have been
130 restructured.

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132 • All of the degree programs have increased math requirements
- 133 • The Master's degree program has been redesigned to include concentration tracks
134 in chemistry and in biochemistry, including a core curriculum of courses in
135 organic chemistry, physical chemistry, analytical chemistry, and biochemistry
- 136 • Concentrations in the Master's program are distinguished through elective courses

- 137 • Three new 600-level core courses and two new 600-level electives were
138 developed
139

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

- 148
- 149 • Revise the prerequisites for introductory courses
 - 150 • Increase the number undergraduate biochemistry and chemistry courses taught by
151 tenured or tenure track faculty
 - 152 • Further upgrade laboratory curriculum
 - 153 • Further upgrade instrumentation
 - 154 • Develop a department policy to standardize lab mechanisms for student safety
155 training and waste handling in research labs
 - 156 • Establish forums for sharing student research activities
 - 157 • Develop new service courses for the Engineering Department and the Earth and
158 Environmental Science Department
 - 159 • Develop two new general education courses that also meet the sustainability
160 overlay requirement
 - 161 • Develop two new graduate-level courses
 - 162 • Increase the number of graduate students through a greater emphasis on
163 recruitment
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167 *d. Assessment*
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169 All programs within the department have five program learning outcomes (PLOs) that are
170 directly mapped to the relevant institutional learning outcomes (ILOs). The department
171 conducts an assessment of a particular PLO every year. In addition, the department
172 assesses PLOs 1 and 2 annually (PLO 1 = demonstrate knowledge in the various areas of
173 chemistry, including inorganic chemistry, analytical chemistry, organic chemistry,
174 physical chemistry and biochemistry; PLO2 = work effectively and safely in a laboratory
175 environment to perform experimental procedures and operate modern
176 chemical/biochemical instruments).

177

178 The results of the assessment showed that students mastered most of the learning
179 objectives, however the department identified the PLO on quantitative reasoning to be the
180 most problematic. The department plans to institute several changes to the program in
181 order to address the issue:
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- 183 ○ Increasing the number of math classes taken by students in all of the
184 undergraduate programs
185 ○ BS chemists and biochemists will take a calculus-based physics series.
186 ○ BA chemists and biochemists will have the choice between calculus- and
187 algebra- based physics series.
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189 **Resources**

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191 Since the previous five year plan, the department has acquired and/or updated a variety
192 equipment.
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- 194 • The department obtained an Inductively Coupled Plasma-Optical Emission
195 Spectrometer (ICP-OES)
- 196 • The department obtained a new High Performance Liquid Chromatography
197 Instrument (HPLC) with fluorescence detection
- 198 • The department obtained a variety of equipment for organic chemistry
199 laboratories, including
 - 200 ○ Microwave synthesizers
 - 201 ○ Infra-red spectrometers
 - 202 ○ Gas chromatographs
 - 203 ○ Digital melt stations
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- 205 • The department updated its physical chemistry labs with improved emission
206 spectrometers, conductivity probes, and gas sensor probes
- 207 • The department upgraded a spectrofluorimeter to include a stopped-flow
208 attachment
- 209 • The department obtained a multi-channel probe for the NMR.

210
211 The department was able to hire a new Instructional Support Technician to replace a
212 previous technician
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214 The department hired a new administrative assistant to replace a previous administrative
215 assistant
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217 The department hired a part time purchasing staffer to replace a previous ASA II
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219 Research lab space and office space will be needed for new faculty hires
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221 The department plans to hire an equipment and stockroom manager to replace a position
222 which had previously been eliminated, as the absence of this position has negatively
223 impacted the ability of the department to maintain and update the department's
224 instrumentation and to improve the laboratory curriculum
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226 **Recommendations**

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

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

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