

# LMC Comprehensive Program Review

## Instructional Units

2017-2018

Program/Discipline: Chemistry

The following provides an outline of the required elements for a comprehensive unit/program review for Instructional Programs and Units. Upon completion of this report, please upload your document in the unit/program review application data/documents tab.

### 1. Program Changes

1.1. How have your degree and certificate offerings changed over the last 5 years? ( e.g. new programs, discontinued or major changes to existing programs)

The AS-T in Chemistry is a new degree, and consequently, the old AS Chemistry degree is no longer offered.

1.2. What changes are you planning to your degree and certificate offering over the next 5 years? What is the rationale for the anticipated changes? Will these changes require any additional resources?

No changes are anticipated.

### 2. Degree and Certificate Requirements

**Please review the data provided on all degree/certificate completions in your program, including locally approved College Skills Certificates from Fall 2012—Spring 2017.**

2.1. For each degree/certificate offered, map a pathway to completion of courses within the major in a maximum of 4 semesters, assuming a maximum of 6-10 units of major courses within a semester. Use the following format:

Name of Degree or Certificate				
Semester	Semester 1	Semester 2	Semester 3	Semester 4
<b>List Courses Needed for Degree or Certificate in each semester.</b>	CHEM-025 General College Chemistry 5 Units  MATH-050 Calculus and	CHEM-026 General College Chemistry 5 Units  MATH-060 Calculus and	CHEM-028 Organic Chemistry 5 Units  PHYS-040 Physics for Scientists and Engineers I 4 Units	CHEM-029 Organic Chemistry 5 Units  PHYS-041 Physics for Scientists and Engineers II 4 Units

	Analytic Geometry I 4 Units	Analytic Geometry II 4 Units		
--	--------------------------------	---------------------------------	--	--

### 3. Frequency of Course Offerings

**Please review the data provided on frequency of all courses offered in your discipline in the last 2 years (Fall 2015-Spring 2017).**

3.1. If a course has not been offered in the past two years, but is required for a degree or certificate, please explain why it has not been offered, and what the plan is to offer it in the future.

All courses have been offered regularly.

3.2. If the course is not required for a degree or certificate, is the course still needed in the curriculum or is the department considering deleting it?

There are 2 courses offered by Chemistry that are not required for a degree: Chem 6 and Chem 7. Both courses will not be deleted.

Chem 6 Introduction to Inorganic and Physical Chemistry is required for students who did not complete a year of high school chemistry (which is a prerequisite for Chem 25, the first course required of the AS-T Chemistry degree). Chem 6 is a requirement of the LMC PTEC program and a prerequisite for many Biology courses.

Chem 7 Introduction to General, Organic and Biochemistry is a prerequisite for LMC Nursing programs. Chem 7 also satisfies the chemistry prerequisite of health career programs requiring only one semester of chemistry, including Kinesiology and most nursing programs at CSUs and four-year colleges.

3.3. For the next two years, project how frequently your program intends to offer each course. Please provide a rationale for any major changes from the last 2 years that you anticipate.

Course	Estimated Number of Sections Offered by Semester			
	Fall 2018	Spring 2019	Fall 2019	Spring 2020
<i>Chem 6</i>	5	5	5	5
<i>Chem 7</i>	3	3	3	3
<i>Chem 25</i>	4	3	4	3
<i>Chem 26</i>	2	3	2	3
<i>Chem 28</i>	2	1	2	1
<i>Chem 29</i>	1	2	1	2
<b>Rationale for any Major Changes</b>				

## 4. Existing Curriculum Analysis

### 4.1. Course Outline Updates

Please review the data provided on the status of COORs in your discipline. (Note: This data does not reflect courses submitted after May 2017.) For each COOR that has *not* been updated since Spring 2012, please indicate the faculty member responsible for submitting the updated COOR to the Curriculum Committee by April 18, 2018.

Course	Faculty Responsible for COOR Update
<i>Chem 6</i>	May 2015
<i>Chem 7</i>	May 2015
<i>Chem 25</i>	May 2017
<i>Chem 26</i>	May 2017
<i>Chem 28</i>	April 2014
<i>Chem 29</i>	April 2014

### 4.2. Course Offerings/Content

How have your courses changed over the past 5 years (new courses, significant changes to existing courses)?	No significant changes.
How have these changes enhanced your program?	

## 5. New Curriculum Analysis

**5.1. If you are creating new degrees or certificates in the next 5 years: (Indicate N/A if no new degrees or certificates are planned.)**

What additional courses will need to be created to support the new degree or certificate?	<b>N/A (none planned)</b>
-------------------------------------------------------------------------------------------	---------------------------

What significant changes to existing course content would need to be made to support the new degree or certificate?	
---------------------------------------------------------------------------------------------------------------------	--

**6. Advisory Board Update (For all CTE TOP coded programs)**

Give an overview of the current purpose, structure, and effectiveness of your Advisory Board. Include: membership, dates of last meetings over the past two years.

**7. Assessment Effectiveness:**

**7.1. Course Level Assessment**

**Please review the data provided on assessment status of courses in your discipline in Cycle 1 ( 2012-2017).**

7.1.1. If there were any courses that were not assessed in Cycle 1, please explain why they were not assessed.

*All were assessed.*

7.1.2. If a course was not assessed in Cycle 1 because it was not offered, what is the future of that course?

- a. Delete the course
- b. Market/promote the course to gain enrollments
- c. Other

*N/A*

7.1.3. Course level assessment should be meaningful, measurable and manageable. Overall, reflecting on the course level assessment, please rate the degree to which you feel your assessments meet these 3M's.

Meaningful: 2

1	2	3
The assessment was not meaningful in collecting data or information that supported course improvement or pedagogical changes.	The intent was understood, but the outcome fell short of meeting the objective of course assessment, which is to improve student learning. The changes to the course or pedagogy to support the course were not clear.	Changes were made to the course content or delivery to improve course effectiveness. The process promoted pedagogical dialog within the department, and changes were adopted accordingly.

Measurable: 3

1	2	3
The data collected did not inform teaching and learning.	The assessment produced some measurable information, but created more questions than answers.	Results were straightforward and easy to interpret. The course of action to improve the course or its delivery was clear from the data that was collected.

Manageable: 1 (see 7.2.2 below)

1	2	3
Assessment was not manageable.	The assessment process was somewhat manageable, but posed challenges to implement across the program.	The assessment was easily scaled across the department so that full- and part-time faculty could participate with meaningful outcomes.

7.1.4. What changes in the assessment process itself would result in more meaningful data to improve student learning?

Our department would like to consider other assessment tools and investigate other methods of measurement that leads to productive discussions about equity as well as program improvement.

One such change was initiated by Paul West, Science Lab Coordinator. He has undertaken an assessment process using SurveyMonkey to solicit feedback about our Chemistry Stockroom and then to direct efforts to improve the laboratory program based on that feedback.

7.1.5. Share an outcome where assessment had a positive impact on student learning and program effectiveness.

The assessment of PSLO4 revealed an area of student learning that needed attention. Driven by these assessment results, the instructor made significant changes in pedagogy. New assessment data indicates that these changes, including the change from 3 exams to 4 exams during the semester, has helped students become more proficient in PSLO4 (predicting the products of organic chemical reactions).

## 7.2. Program Level Assessment

7.2.1. In 2016-2017, units engaged in program level assessment. **Please submit all Program Level Assessment Reports using the link provided.** Describe one important thing you learned from your program level assessment.

Please see responses to 7.1.5 (above) and 7.2.2 (below).

7.2.2. What was the biggest challenge in conducting program level assessment?

After completing the assessment report of the PSLO's in Chemistry, we found significant overlap among the PSLO's, and often one assessment revealed information about several of our PSLO's. Furthermore, our assessment efforts revealed that some of our PSLO's are too specific. To focus better on student learning, the Chemistry Department will work to rewrite and consolidate our PSLO's to make them more effective.

7.2.3. What resource needs, if any, were identified in your program level assessment?

When our department discussed the results of our program level assessment from a holistic perspective, we realized that our teaching laboratories may be underutilized as opportunities for student learning. Each of our PSLO's have a laboratory component; furthermore, PSLO 6 and PSLO 7 are achieved only in the Chemistry Lab. Therefore, our department must take steps to properly equip our laboratories so that students have access to effective learning experiences. We will address shortcomings of the laboratories and stockroom later in this report.

## 8. Course Success/Retention Analysis

**Please review the data provided on course retention and success, which has been disaggregated by as many elements as district can provide in their SQL Report**

One of our college goals as stated in our Integrated Plan is to "Increase successful course completion, and term to term persistence." Our Equity Plan identifies African- American and low income students as disproportionately impacted in terms of successful course completion. (Foster youth are also disproportionately impacted on this indicator, but numbers are too small to disaggregate by discipline/program) Please indicate how well students in these groups are succeeding in your discipline.

	African-American	Low Income Students	All students in program/discipline
<b>Completion Rate (program/discipline)</b>	83.0% (FA16) 82.3% (SP17)	84.5% (FA16) 87.8% (SP17)	85.7% (FA16) 85.5% (SP17)
<b>Success Rate (program/discipline)</b>	67.9% (FA16) 64.5% (SP17)	75.1% (FA16) 79.7% (SP17)	76.9% (FA16) 77.8% (SP17)

8.1. In looking at disaggregated data on success/retention, is there anything else that stands out?

Yes, the African-American students have similar completion rates as other groups, but their success rates are significantly lower.

8.2. What are some strategies that might help students, particularly African-American, foster youth, and low income students successfully complete courses in your discipline? What resources would be needed to implement these strategies?

(Answer to 8.2) Because the data indicates African-American students stay in our courses to the end (same completion rates as other populations), but have lower success rates, teachers have opportunities to intervene one-on-one with these students. If we reach out to them more, perhaps we can help each student identify and address the factors that are limiting their academic success.

The SQL Reports did not reveal achievement gaps for foster youth and low income students, so our department should focus on strategies that assist African-American students as well as strategies that assist all students. As described in the response to 7.2.3, our department needs resources to properly equip our laboratories so that students have access to effective learning experiences. More effective laboratories with a properly supplied chemistry stockroom should contribute to higher completion and success rates for all students.

We are hopeful that the Chem 25 Prep Workshop held on a Saturday before the start of each semester not only serves to prepare all students for Chem 25, but may also work to close achievement gaps. Perhaps a Physical Sciences-Specific ACS-10 course may be useful in this regard and is under consideration.

Funded by LMC equity funds, the Chemistry Stockroom and an LMC student are undertaking a project to mount portraits and descriptions of a multiculturally diverse group of scientists to be displayed at the fume hoods in both teaching laboratories. The portraiture project ties in to 8.2 by providing concrete, successful and diverse examples of professionals. This ties in to providing a vision (goal) for students to relate to and for them to move toward. The portraiture project should be completed by Spring 2018.

Julie Hubbard, LMC part-time instructor and Liberty High School teacher in Brentwood, is working to set up a Dual Enrollment program so that high school students can take Chem 6 at Liberty HS. This will prepare students for college-level chemistry as well as enable them to earn college credits while still in high school. It will be interesting to see if this program can address equity gaps.

## 9. Goals

### 9.1. Review your program's goals as listed in response to the final question of your 2012-2013 Comprehensive Program Review posted in the Data Repository of the PRST.

Highlight some of the key goals that were achieved over the past 5 years. What were the key elements that led to success?	Goals achieved from the 2012-2013 Comprehensive Program Review were to offer the AS-T degree in Chemistry, increase the number of transfer students, and install a new NMR spectrometer in the lab. Key elements to success were determined and hard-working faculty, a steady increase of STEM students at LMC, and funding from the HSI STEM Grant.
---------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<p>Were there any goals that did not go according to plan? What were the key elements that impeded the progress on these goals?</p>	<p>Goals not achieved included maintaining lab equipment in a fully functional state and resolving facilities issues, especially those that negatively impact learning. The key elements that impeded progress are time and money.</p>
-------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**9.2. Consider the College’s Strategic Directions along with our Integrated Planning Goals listed here:**

College Strategic Directions 2014-2019	Integrated Planning Goals
<p>1. Increase equitable student engagement, learning, and success.</p> <p>2. Strengthen community engagement and partnerships.</p> <p>3. Promote innovation, expand organizational capacity, and enhance institutional effectiveness.</p> <p>4. Invest in technology, fortify infrastructure, and enhance fiscal resources.</p>	<p>1. <b>ACCESS:</b> increase access through enrollment of students currently underserved in our community.</p> <p>2. <b>IDENTIFYING PATHWAYS:</b> Increase the number of students that define a goal and pathway by the end of their first year.</p> <p>3. <b>COLLEGE-LEVEL TRANSITION:</b> Increase the number of students successfully transitioning into college level math and English courses.</p> <p>4. <b>PERSISTENCE &amp; COMPLETION:</b> Increase successful course completions, and term to term persistence.</p> <p>5. <b>EQUITABLE SUCCESS:</b> Improve the number of LMC students who earn associates degrees, certificates of achievement, transfer, or obtain career employment.</p> <p>6. <b>LEARNING CULTURE:</b> Enhance staff, faculty and administration’s understanding and use of culturally inclusive practices/pedagogy, demonstrating empathy and compassion when working with students.</p>

List 3 – 5 longer term (5 year) new goals for your program. For each goal, pick 1 – 2 College Strategic Directions and/or 1 – 2 Integrated Planning Goals to which your new goal aligns.

Goals	Aligned College Strategic Direction(s)	Aligned Integrated Planning Goal(s)
<p>Goal 1: <b>Laboratory Best Practices:</b> Implement a Chemical Stockroom program modeled after standard best practices of industrial and</p>	<p>1. Increase equitable student engagement, learning, and success.</p>	<p>5. <b>EQUITABLE SUCCESS:</b> Improve the number of LMC students who earn associates degrees, certificates of</p>

government labs and Resolve laboratory and stockroom issues that negatively impact student learning.	4. Invest in technology, fortify infrastructure, and enhance fiscal resources.	achievement, transfer, or obtain career employment.
<b>Goal 2: Chemistry at Brentwood:</b> Hire and Mentor a new full-time Chemistry Instructor in anticipation of expansion of the Chemistry Program into the new Brentwood Center	1. Increase equitable student engagement, learning, and success. 3. Promote innovation, expand organizational capacity, and enhance institutional effectiveness.	1. ACCESS: increase access through enrollment of students currently underserved in our community. 5. EQUITABLE SUCCESS: Improve the number of LMC students who earn associates degrees, certificates of achievement, transfer, or obtain career employment.
<b>Goal 3: Undergraduate Research:</b> Provide all STEM majors a research experience during their studies at LMC	1. Increase equitable student engagement, learning, and success. 3. Promote innovation, expand organizational capacity, and enhance institutional effectiveness.	5. EQUITABLE SUCCESS: Improve the number of LMC students who earn associates degrees, certificates of achievement, transfer, or obtain career employment.
Goal 4:		
Goal 5:		

**OPTIONAL**

9.3 Resource needs to meet five-year goals

<b>Faculty/Staff Resource Request</b>			
Department/Unit Goal - Reference #		Strategic Objective - Reference #	
Department/Unit Name		Position Name/Classification	FTE
Position Type	Funding Duration	Funding Source	Est. Salary & Benefits
<input type="checkbox"/> Faculty R/T <input type="checkbox"/> Classified <input type="checkbox"/> Manager <input type="checkbox"/> Student	<input type="checkbox"/> On-going/Permanent <input type="checkbox"/> One-time	<input type="checkbox"/> Operations (Fund 11) <input type="checkbox"/> Other <input style="width: 100px; height: 20px;" type="text"/>	
<b>Justification:</b>			

--

<b><u>Operating Resource Request</u></b>	
Department/Unit Goal - Reference #	Strategic Objective - Reference #
<b>Goal 1: Laboratory Best Practices</b>	#1 and #4
Department/Unit Name	Resource Type
Physical Science - Chemistry	<input checked="" type="checkbox"/> Equipment <input type="checkbox"/> IT Hardware/Software <input checked="" type="checkbox"/> Supplies <input type="checkbox"/> Facility Improvement <input type="checkbox"/> Service/Contract <input type="checkbox"/> Other
General Description	Est. Expense
Obtain Missing Equipment: -1 new Spec 200 spectrophotometer (\$3000). - 4-L or 10-L and 2 2-L Dewar flasks (\$1500) for liquid nitrogen - Larger Nalgene containers for standardized NaOH/HOAc solutions (20 L) (\$300) -50, 100, 150 ml beakers (we're low). (\$700) - Burets 15 ct. ( \$ 1500)	\$7000
Justification:	
Another spectrophotometer will enable more students to access this chemical instrument which is common in modern laboratories, and consequently, more access will provide more learning opportunities. The new SPEC 200 spectrometer would also allow for a more modern interface control (i.e., wireless/web based interfaces) rather than analog dials. This aligns the instrument to current technology used by students on a daily basis (cell phones, wireless communications and control, etc.) The Dewar flasks will allow for laboratory projects involving low temperature experiments: again, this is common to teaching laboratories. Finally, containers, beakers, and burets are common laboratory equipment that our stockroom and laboratories are lacking: because these items are missing, students must either share or do without, both of which impede student learning.	

<b><u>Operating Resource Request</u></b>	
Department/Unit Goal - Reference #	Strategic Objective - Reference #

<b>Goal 1: Laboratory Best Practices</b>	#1 and #4
<b>Department/Unit Name</b>	<b>Resource Type</b>
Physical Science - Chemistry	<input checked="" type="checkbox"/> Equipment <input type="checkbox"/> IT Hardware/Software <input type="checkbox"/> Supplies <input type="checkbox"/> Facility Improvement <input type="checkbox"/> Service/Contract <input type="checkbox"/> Other
<b>General Description</b>	<b>Est. Expense</b>
Roller Cart Storage Truck for Organic Chemistry Kits	<b>\$ 1377.30</b>
<b>Justification:</b>	
<p>When moving the organic chemistry kits from one area to another, the stockroom presently needs to use a basket cart. Although this works, it is very easy for a kit to fall off on the floor, and since they have a significant amount of glassware in them, breakage might happen. Each kit retails around \$900. Reducing the likelihood of breakage is always a goal to reduce injury as well as further expenses. When the Roller Cart Storage Truck is obtained, the existing file cabinets presently used for storing the organic chemistry kits can be emptied and excessed. The space that will be freed up from the file cabinets will be used to establish a deionized water monitoring station.</p>	

<b><u>Operating Resource Request</u></b>	
<b>Department/Unit Goal - Reference #</b>	<b>Strategic Objective - Reference #</b>
<b>Goal 1: Laboratory Best Practices</b>	#1 and #4
<b>Department/Unit Name</b>	<b>Resource Type</b>
Physical Science - Chemistry	<input checked="" type="checkbox"/> Equipment <input type="checkbox"/> IT Hardware/Software <input checked="" type="checkbox"/> Supplies <input checked="" type="checkbox"/> Facility Improvement <input type="checkbox"/> Service/Contract <input type="checkbox"/> Other
<b>General Description</b>	<b>Est. Expense</b>
Establish a Quality Control Program. This requires: - Certified Balance Masses (\$2000) - High Precision Electronic Balance (\$4000) - Reagents and Equipment for Water Analysis (\$3000) - Workbench/Table, Notebooks, etc. (\$1000)	<b>\$10,000</b>
<b>Justification:</b>	
<p>To model the stockroom operations as per various industries (ISO-17025 for environmental analysis, ISO-9001 for manufacturing), some essential equipment must be purchased. These items will allow a quality assurance program to be established. Such a program is needed to troubleshoot as well as prevent problems caused by chemical decomposition and contamination. This program will include a deionized water monitoring station.</p>	

<b><u>Operating Resource Request</u></b>	
Department/Unit Goal - Reference #	Strategic Objective - Reference #
<b>Goal 1: Laboratory Best Practices</b>	#1 and #4
Department/Unit Name	Resource Type
Physical Science - Chemistry	<input type="checkbox"/> Equipment <input type="checkbox"/> IT Hardware/Software <input type="checkbox"/> Supplies <input checked="" type="checkbox"/> Facility Improvement <input type="checkbox"/> Service/Contract <input type="checkbox"/> Other
General Description	Est. Expense
Replace Student Lab Lockers	\$200,000?
Justification:	
<p>Unfortunately, the cabinets that house the student lab lockers are made of low quality particle board. These lockers contain beakers, test tubes, and other essential equipment, and they slide on rails. Sadly, the screws that attach these rails are falling out. Also, the locking mechanisms are failing because the particle board is deteriorating. Consequently, several lockers are unusable already, and the situation is getting worse daily. LMC Maintenance has tried to repair the lockers many times over the years, and they recommend to completely replace them.</p> <p>As of today, 44 of 360 lockers have been taken out of service due to malfunction. This is 12% of the total between two rooms and caused two courses to be assigned the same set of lockers in Spring 2018. 18 lockers are needed for a full (36 students working in pairs) course. One additional laboratory section could be added if the lockers are brought back into service.</p>	

<b><u>Professional Development Resource Request</u></b>	
Department/Unit Goal - Reference #	Strategic Objective - Reference #
Department/Unit Name	Resource Type
	<input type="checkbox"/> Conference/Meeting <input type="checkbox"/> Materials/Supplies <input type="checkbox"/> Online Learning <input type="checkbox"/> IT Hardware/Software <input type="checkbox"/> Other
General Description	Est. Expense

<b>Justification:</b>	