



Chemical and Materials Engineering Program Review 2018-19

Closing MOU

Date: August 20, 2019

Overview

Degree/Certificate Programs Reviewed: Bachelor of Science Chemical Engineering
Bachelor of Science in Materials Science & Engineering
Master of Science in Chemical Engineering
Master of Science in Materials Science & Engineering
Ph.D. in Chemical Engineering
Ph.D. in Materials Science & Engineering

Department Chair & Dean: Jeffrey LaCombe, Chair; Manos Maragakis, Dean

External Reviewers & Affiliation: Undergraduate:
Dr. Brian J. Swenty, College of Engineering and Computer Science, University of Evansville, Accrediation Board for Engineering and Technology (ABET) Chair
Dr. Mark Osborn Federle, Academic Affairs, Marquette University, Accrediation Board for Engineering and Technology (ABET) Chair
Dr. Jean Ragan Stephenson Blair, United States Military Academy, Accrediation Board for Engineering and Technology (ABET) Chair
Dr. Gillian Mary Bond, New Mexico Institute of Mining and Technology, ABET
Dr. Corey Leclerc, New Mexico Institute of Mining and Technology, ABET
Graduate:
Dr. Darryl Butt, College of Mines and Earth Sciences, University of Utah
Dr. Amit Misra, Department of Materials Science & Engineering, University of Michigan
Dr. James Petersen, Washington State University
Dr. Bruce Gates, University of California Davis

Date of External Visit: September 17-19, 2017, May 21-22, 2018, & March 4-5, 2019

Review Process Summary

The Chemical and Materials Engineering programs were scheduled for regular program review as mandated by the Board of Regents and University policy. Self-study documents for the department and its programs were developed by the department faculty and completed in Summer 2017 for undergraduate programs, and Spring 2018 for Chemical Engineering, and Spring 2019 for the Materials Science and Engineering graduate programs. These respective reports were provided to the undergraduate reviewers from the Accrediation Board for Engineering and Technology (ABET) before they conducted an on-campus visit on September 17-19, 2017 and provided to the two reviewers for Chemical Engineering before they conducted an on-campus visit on May 21-22, 2018, and provided to the two reviewers for Materials Science Engineering before they conducted an on-campus visit on March 4-5, 2019. The external reviewers appraised the program and met with relevant faculty, staff, students and administrators to determine the

department's accomplishments, examine strengths and weaknesses, and identify opportunities as it plans for the future. A final report was issued by the site visitors shortly after the review visit. In accordance with institution practice, responses to the review were solicited from the department and the dean. A final meeting of senior administration from the Provost's Office, the College of Engineering and the Department of Chemical and Materials Science and Engineering took place on August 20, 2019. This document represents the final MOU of recommendations and findings from the review.

Signatures

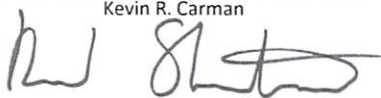
Executive Vice President &
Provost:



Kevin R. Carman

Date: 9/27/19

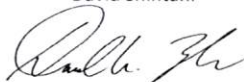
Vice Provost, Undergraduate
Education:



David Shintani

Date: 9/27/19

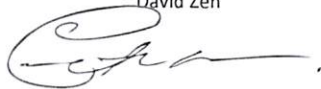
Vice Provost, Graduate Education
& Dean, Graduate School



David Zeh

Date: 9/27/19

Dean, College of Engineering



Manos Maragakis

Date: 9/27/19

Chair, Chemical & Materials
Engineering



Jeffrey LaCombe

Date: 9/27/19

Major Findings and Conclusions

1. The Chemical Engineering program has a strong foundation in undergraduate education, with an exceptional laboratory and chemical process safety sequences starting in the freshman year and extending through senior year.
2. The Chemical Engineering program has an exceptionally strong cohort of Latino faculty.
3. Materials Science boasts faculty members with well funded projects that allow student laboratory participation.
4. Undergraduate students in Materials Science and Engineering are recipients of nationally recognized scholarships through such entities as the Department of Energy and the American Nuclear Society.

Next Steps for this Program/Department

1. Strategic Planning and Building a Vision for the Department:

The Chemical Engineering graduate program was noted for a strong foundation in undergraduate education, an exceptionally strong cohort of Latino faculty and is positioned to make significant impact bringing about national recognition. In order to better enable the program to take advantage of these strengths, it was recommended that a vision statement be developed to assist the faculty and students in the articulation of the position and trajectory of the program. This vision statement should give note to the strong Latino faculty presence and underline the opportunities that exist between the program and economic development in the state. Much emphasis was made on the potential for positive outcomes in collaborating with local and state industries, particularly in the areas of alumni relations, board participation and development.

In terms of Materials Engineering strategic planning, updating of the strategic plans and working to ensure that faculty are conversant with the plan was encouraged, which the department is amenable to pursuing. It was also mentioned that participation in national and international engineering boards and councils, such as the University Materials Council (UMC), could enhance the recognition and national reputation of the department. It is noted that the department chair has been a member of UMC for a number of years, but is open to taking on a leadership role to assist in recognition of the program. Encouragement of working across disciplines, particularly with College of Science programs, to strengthen the course offerings and opportunities for students was put forth, and it is a suggestion that the department has previously considered and interested in pursuing.

Looking at the longer-term goals and outcomes of having the Chemical and Materials programs managed in the same department was encouraged by reviewers to leverage synergies and identify issues needing correction.

2. Graduate Curriculum & Education

The Chemical Engineering program was cited as being productive, but concerns were expressed regarding the amount of required coursework. It was suggested that efforts for graduate students, particularly those pursuing a Ph.D., should be shifted from class work to research as is consistent with programs at research institutions. Also the number of GTA positions was noted as being deficient. It was encouraged that assignments and activities of GTAs be monitored closely to assist in determining the number to graduate students to admit into the program.

Several suggestions were put forth to enhance the experience for students in the Materials Engineering program. Those suggestions included: participation in Gradventure and GradFIT, development of core courses to encourage a consistent foundation, reconsideration of heavy course requirements that focus on classroom work, development of a graduate student organization, and ensuring that the Graduate Program Director is held by a tenured faculty member. The department was receptive to exploring and possibly implementing all of these recommendations.

3. Curriculum—Undergraduate

The Chemical Engineering program was noted as having a substantial number of students engaged in internships through the program and the program's emphasis on safety thought the lab curriculum and in practice was cited as being excellent. The Materials program was noted for having well-funded research faculty members who encourage undergraduate participation in the research, and students in the program have received nationally recognized scholarships. Areas of desired improvement for both the Chemical and Materials programs include the strengthening of program educational objectives to better align with constitute needs, the accurate measurement of desired student outcomes and using that information for continuous improvement, and the consistent use of engineering design standards and realistic constraints, specifically with the design curriculum.

4. Undergraduate Recruitment/Enrollment/Progression

To increase enrollment among Chemical Engineering students it was recommended to pursue recruitment opportunities in southern Nevada, giving attention to the potential for recruiting Latinx students. Collaborating with Nevada based industries also provides opportunities to make a connection between the education received in the program and practical use, and there is evidence to suggest such partnering is strongly encouraged by Nevada's lawmakers who could be invited to provide additional support of these efforts.

Concerning Materials Engineering, it was suggested that more effort be made to expose students to career opportunities earlier in their academic program. Introducing Materials Engineering to student across engineering, particularly those students who are undecided, can assist in growing the program and pathing students into the graduate studies in the field, which the department is interested in exploring.

5. Space

Lack of laboratory space and modern equipment was noted when discussing the Chemical Engineering graduate program. It was suggested that space be provided at approximately 175 square feet per researcher (Ph.D. student, postdoctoral scholar), currently the program is well below that suggestion amount.

Reviewers did note there had been modest improvements in shared research space in the Materials Engineering program, but encouraged efforts to continue on expanding resources and exploring shared resources options across campus, which the department is interested in pursuing.

8. Faculty

Chemical Engineering faculty members were noted as being effective educators who are dedicated to their program. Concern was communicated regarding the department's ability to attract and retain talented faculty given evidence that salaries and start-up packages offered were lower than national standards. Since the visit, start-packages have been increased and are now at competitive levels. Other areas for suggested change include stronger mentorship for junior faculty, development of senior faculty to advance the department vision, and recruitment of new faculty to support the strategic vision and goals of the department. Opportunities suggested include pursuing grants and funding that focus on faculty development and pathways for high school to Ph.D. education, particularly for the Latinx community given the strong Latino staff that already exists in the program.

Teaching loads were cited as being high, particularly for a research institution, with the suggestion made to shift focus from coursework to research and augment teaching by utilizing industry professionals in the area. Finally, it was noted that faculty staffing levels should be increased to meet the needs of a program of this size.

It was noted that there was a lack of diversity among Materials Engineering faculty, specifically with regard to female faculty. This lack of diversity was also noted among the student population. The department is aware of this deficiency and is exploring options to increase gender and ethnic diversity, and will be looking to administration and best practices to assist in this effort. Due to the lack of senior faculty in the Materials Engineering program, mentoring of junior faculty will be a challenge. Pursuing external mentorship programs was suggested and the department is interested in exploring this option with administration.

The department should keep in mind that it is the expectation at the university that tenured faculty in all departments continue to build a portfolio of scholarly work following achievement of tenure in order to progress successfully through the promotional ranks to full professor.

Action Items

The department will:

1. complete revamping of the assessment process in alignment with ABET requests.
2. explore more direct recruiting activities specifically for Chemical and Materials Eng in collaboration with College of Engineering administration, specifically for undergraduate enrollment. This is also a service opportunity for faculty.
3. explore the possibility of moving the Materials graduate program toward an interdisciplinary structure with support of Administration and participating colleges, and building a case for the benefit across all engaged programs.
4. leverage the GradFIT and Gradventure programs to increase domestic graduate student enrollment and diversity. Also participate in the CIMER mentor training provided by the Graduate School in order to encourage positive interactions between mentors and students.
5. encourage graduate directors to work with the Graduate School to develop tools and explore opportunities for strengthening graduate student engagement.

6. develop a best practices argument to present to the graduate school for adjustment in course work requirements.
7. engage in an exercise to have faculty develop their own “elevator talk” regarding the department shared vision and strategic plan.
8. carry out a comparison study of peer institutions regarding program requirements. Using Curricular Analytics and Navigate (EAB), the college and department will examine degree pressure points (where students are not on track to be successful in the program), identify ways to simplify degree paths, and give advising to those students who appear not to be on a successful track. Emphasis on student success should be on both the undergraduate and graduate levels. This is being asked of all program across the University. The goal is to have reports by the end of the fall 2019 semester.

Vital Statistics on NSHE Reports

Bachelor of Science in Chemical Engineering

Number of students with declared major in the program area 2018-19:	150
Number of graduates from the program, 2016-17:	34
Number of graduates from the program, 2017-18:	41
Number of graduates from the program, 2018-19:	33
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	230

Bachelor of Science in Materials Science & Engineering

Number of students with declared major in the program area 2018-19:	43
Number of graduates from the program, 2016-17:	4
Number of graduates from the program, 2017-18:	8
Number of graduates from the program, 2018-19:	6
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	334

Masters of Science in Chemical Engineering

Number of students with declared major in the program area 2018-19:	3
Number of graduates from the program, 2016-17:	0
Number of graduates from the program, 2017-18:	1
Number of graduates from the program, 2018-19:	2
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	24*

Masters of Science in Materials Science & Engineering

Number of students with declared major in the program area 2018-19:	6
Number of graduates from the program, 2016-17:	4
Number of graduates from the program, 2017-18:	3
Number of graduates from the program, 2018-19:	4
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	61*

Ph.D. in Chemical Engineering

Number of students with declared major in the program area 2018-19:	10
Number of graduates from the program, 2016-17:	4
Number of graduates from the program, 2017-18:	1
Number of graduates from the program, 2018-19:	0
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	24*

Ph.D. in Materials Science & Engineering

Number of students with declared major in the program area 2018-19:	20
Number of graduates from the program, 2016-17:	4
Number of graduates from the program, 2017-18:	3
Number of graduates from the program, 2018-19:	3
Headcount of students enrolled in any course related to the program (duplicated), Fall 2018:	61*

* Cannot differentiate between MS and PhD