THE UNIVERSITY OF UTAH

September 5, 2017

Ruth V. Watkins
Senior Vice President for Academic Affairs
205 Park Bldg.
Campus

Approved
R Watkins
9-7-17

David W. Pershing
9-7-17

RE: Graduate Council Review
Department of Mining Engineering

Dear Vice President Watkins:

Enclosed is the Graduate Council's review of the Department of Mining Engineering. Included in this review packet are the report prepared by the Graduate Council, the Department Profile, and the Memorandum of Understanding resulting from the review wrap-up meeting.

After your approval, please forward this packet to President David Pershing for his review. It will then be sent to the Academic Senate to be placed on the information calendar for the next Senate meeting.

Sincerely,

David B. Kieda
Dean, The Graduate School

Encl.

XC: Michael G. Nelson, Chair, Department of Mining Engineering
Darryl P. Butt, Dean, College of Mines and Earth Sciences

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The Graduate School - The University of Utah

GRADUATE COUNCIL REPORT TO THE SENIOR VICE PRESIDENT
FOR ACADEMIC AFFAIRS AND THE ACADEMIC SENATE

April 24, 2017

The Graduate Council has completed its review of the Department of Mining Engineering. The External Review Committee included:

Rick Honaker, PhD
Professor and Chair
Department of Mining Engineering
University of Kentucky

John Kemeny, PhD
Professor and Chair
Department of Mining and Geological Engineering
University of Arizona

Vladislav Kecojevic, PhD
Professor of Mining Engineering and Massey Foundation Professor
Department of Mining Engineering
West Virginia University

The Internal Review Committee of The University of Utah included:

John McLennan, PhD (Chair)
Associate Professor
Department of Chemical Engineering

Frank Drews, PhD
Professor,
Department of Psychology

Pedro Romero, PhD
Associate Professor
Department of Civil and Environmental Engineering

This report of the Graduate Council is based on the self-study submitted by the Department of Mining Engineering, the reports of the external and internal review committees, and the responses to the internal and external committee reports by the Department Chair and Dean of the College of Mines and Earth Sciences.

DEPARTMENT PROFILE

Program Overview

The Department of Mining Engineering (hereinafter the "Department") is one of four departments within the College of Mines and Earth Sciences, and one of the first established at the University of Utah. The mission of the Mining Engineering Department is to prepare students for productive careers in mining and related industries or disciplines, and to provide knowledge useful for producing the region's mineral resources. The Department has a strong focus on the education of undergraduates in all major aspects of mining. Graduates from the Department are recognized for their rigorous education and have an excellent record of employment. The Department also offers graduate ME, MS, and PhD degrees.

The Chair and senior faculty have guided the Department in realizing the recommendations of the 2010 review. Since the last review, the Department has increased the number of tenure-line faculty from 5 to 6, established a combined BS/MS program, increased undergraduate and graduate enrollment by 50%, and continued its efforts to diversify its faculty and student body and secure funding. The Department established the Center for Mining Safety and Health Excellence in 2012, which, together with the newly established Western Mining Presidential Chair in Mining Safety, has raised the international and national profile of the Department in the area of mining safety.

Faculty

The Department has 6 tenure-line faculty and five career-line and adjunct faculty. This represents an increase in both ranks with respect to the past review. Despite the small size of the faculty, the Department teaches a large number of undergraduate courses, plus graduate courses upon request. This results in a teaching load that is high compared to other departments in the College. The career-line and adjunct faculty and instructors are all well qualified and offer courses in a wide range of areas. All members of the faculty are highly regarded by the students and have won a large number of awards for excellence in teaching.

The tenure-line faculty has a good distribution across ranks, with three professors, one associate professor, and two assistant professors. The associate and assistant professors recently joined the Department, bringing expertise in the areas of data analysis, mine design and modeling, and rock mechanics. It is expected that this important development will help invigorate the recruitment of graduate students and the competition for research awards in new areas. There is, however, an experience gap in the Department, as the average age of its three most senior members is 70, and they are expected to retire in the next few years. This calls for careful planning of hiring of faculty at different ranks, and mentoring the new faculty in administrative roles.

Tenure-line faculty is predominantly male (5 of 6) and white (5 of 6; 1 is Indigenous). Since the last review the Department has hired two female assistant professors; one of them left for Colorado School of

Mines after her third-year review. The ratio of women in the faculty, while low, is comparable to the national average in the profession. The career-line and visiting faculty are also predominantly male and all white.

Two tenure-track assistant professors and the Chair in Mining Safety have left the Department within the last three years. The Department is planning to hire into the Chair position soon. The departure of the assistant professors, while for different reasons, points to the need to develop a mentoring system that helps junior faculty navigate the intricacies of the RPT process; the competing demands of teaching, service and research; finding sources of funding; and applying for and managing grants. The external committee expressed concern that a significant number of faculty publications were in sources that would not be favorably considered in promotion and tenure reviews in peer institutions in the US. The external committee also encouraged the faculty to take leadership roles in professional associations.

Students

Proactive outreach by the Department has resulted in a 50% increase in the undergraduate and graduate student body since the last review. The external reviewers noted that the Department has been very successful in recruiting female students in a proportion that is high compared to Mining Engineering departments at peer institutions. The reviewers note, however, that the graduate enrollment is still low for the size of the Department.

The Department has actively diversified the student body since the last review. The ratio of female students and ethnic minorities has increased. In 2016, 6 out of 14 graduate students were female, 2 Hispanic or Black, and 3 non-resident alien. The same year, 15 out of 65 undergraduate students were female, and 9 from underrepresented ethnic groups. The representation of women and minorities among the students of the Department exceeds the national average.

The students express satisfaction with the program, faculty and staff, and the opportunities to study abroad. Academic advising of graduate and undergraduate students is provided by the Administrative Manager of the Department, who is currently overextended as she also handles outreach, payroll, class scheduling, travel, reimbursements, organization of events, etc. Undergraduate students stress the importance of advising to timely complete the course work and to plan internships. Graduate students request more advising and a more descriptive graduate handbook.

Curriculum

The Department offers a comprehensive undergraduate BS degree in Mining Engineering, and used to require and now encourages all graduates to take the Fundamentals of Engineering exam for their graduation. Undergraduate students indicate that there are enough classes offered, and that having a student advisor to guide them in the selection of classes is paramount to complete the degree in a timely manner. The Department offers several opportunities for professional development, including seminars by guest speakers from industry, government, and academia; internships with industry and government organizations; and mentoring in oral and written communication.

The Department offers ME, MS, and PhD graduate degrees. A combined BS/MS program approved in 2011 has already enrolled 10 students. An MS is required for admission to the PhD program,

although the faculty approves exceptions on a case-by-case basis. The Department has awarded 7 PhD and 13 MS degrees since 2009. This number is still low compared to programs in peer institutions, and it is expected to increase with the recent hiring of three new faculty.

The graduate handbook does not prescribe a course sequence. Graduate students express uncertainty or lack of familiarity with the requirements for graduation and they indicate that they mostly receive advice from the Department Administrative Manager. Graduate classes are taught on demand, increasing the load on the already stretched faculty. In 2010 the Department prepared to offer a course jointly with Colorado School of Mines to pool resources in the education of graduate students. These efforts seem to have stalled.

Program Effectiveness and Outcomes Assessment

The Mining Engineering program is accredited by ABET, which sets stringent learning outcomes for undergraduate students in engineering. Each outcome is associated with specific performances that the student must complete as part of the listed course requirements. Undergraduate students were also required, and are now encouraged, to take the Fundamentals of Engineering (FE) exam as requisite for graduation. The educational outcomes are assessed through class assignments and examinations, the FE examination, course evaluations and exit interviews for graduates, faculty assessment, and surveys of alumni and employers. The students that graduate from the Department successfully find employment in a variety of industries. All students surveyed by the Department reported being employed, and current students were confident about the prospects of employment upon graduation. These facts point to a very effective undergraduate program.

Learning outcomes for graduate students are not as clearly specified; they are set as a list of milestones. The Department recognizes the need to develop specific learning outcomes and methods for assessing the effectiveness of the program for graduate students.

Facilities and Resources

The offices, computer labs and some of the laboratories of the Department are located in the Browning Building. The teaching and research laboratories are supported by a research device technician who reports to the College. The lack of laboratory staff exclusive for the Department may constrain the productivity and research expansion of the Department.

The computer labs are equipped with licensed mining software. The students indicate that the availability of computer labs is limited by their use in classroom instruction. They also report a need for chairs and tables to replace broken furniture in the lab, and request a dedicated place for studying in the building.

The Department has a single staff member, the Administrative Manager, who is in charge of, among other things, payroll, expenditures, research budgets, travel, scheduling of classes and facilities, and who assists with student advising. In most Mining Engineering departments, distinct staff members are responsible for accounting and business, outreach, fundraising and branding. The demands on the

Administrative Manager constrain the ability of the Department to grow its enrollment, increase its fundraising, and expand research and outreach programs.

COMMENDATIONS

1. The Department is commended for its collegiality, the mutual appreciation and respect of faculty, staff and students, and their commitment to the program. Faculty and staff are highly energized to serve in the best interests of the graduate and undergraduate students.

2. The undergraduate program is nationally recognized for its rigor on engineering fundamentals and the quality, breadth of knowledge and experience of its graduates.

3. The recruiting efforts of the Department have resulted in a 50% increase in the number of graduate and undergraduate students since the last review.

4. The outreach efforts of the Department have resulted in a significant increase in gender diversity of the student body and faculty, placing it above the national average for Mining Engineering.

5. The faculty has been recognized for their excellence in teaching and has successfully attracted research awards. The recent hiring of three excellent new faculty will broaden the teaching and research capabilities of the Department and its ability to attract research awards in diverse areas.

RECOMMENDATIONS

1. Institute a mentoring committee for each junior faculty member that would advise the new faculty on the competing demands of teaching, research and service, and assist with finding funding opportunities, applying for grants, and understanding the RPT process and requirements.

2. Improve graduate and undergraduate student advising through the appointment of a dedicated professional advisor.

3. Strengthen the graduate program through an increase in the number of graduate students and research funding to support them. Establish innovative core graduate courses and set specific learning outcomes. Update and make available the graduate handbook. The recent hire of three new faculty in exciting areas makes the growth promising. Partnership on graduate offerings with other departments and universities is encouraged.

4. Increase the national and international visibility of the Department by taking leadership roles in professional organizations and publishing research in peer-reviewed, high-impact journals beyond the mining profession.

5. Staff the Department with a dedicated laboratory technician to keep up with the demands of teaching labs and research projects. Assign resources to keep and upgrade the website and mining software needed by the Department.

6. Develop a formal strategic plan that includes hiring at mid-level positions in view of the imminent retirement of senior faculty. Consider diversifying research directions that lead to an increase in funding for research. Partner with the College to develop funding strategies to upgrade laboratory equipment.

Submitted by the Ad Hoc Committee of the Graduate Council:

Valeria Molinero, PhD (Chair)
Professor
Department of Chemistry

Cedric Feschotte, PhD
Professor
Department of Human Genetics

Joanna Schaefer, PhD
Associate Professor
College of Social Work

Thomas Richmond, PhD (Undergraduate Council Representative)
Professor
Department of Chemistry

College Name
College of Mines & Earth Sciences

Department Name
Mining Engineering

Program Name
All

Faculty Headcount

		2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
With Doctoral Degrees Including MFA and Other Terminal Degrees	Full Time Tenured Faculty	4	3	3	3	3	3	3
	Full Time Tenure Track	1	1	1	2	2	2	1
	Full Time Career Line/Adjunct Faculty						1	
	Part Time Tenure/Tenure Track							
	Part Time Career Line/Adjunct Faculty			0	0	1	1	
	Total	5	4	4	5	6	7	4
With Masters Degrees	Full Time Tenured Faculty	0	0	0	0	0	0	
	Full Time Tenure Track	0	0	0	0	0	0	
	Full Time Career Line/Adjunct Faculty						1	
	Part Time Tenure/Tenure Track							
	Part Time Career Line/Adjunct Faculty			1	1	2	0	1
	Total	0	0	1	1	2	1	1
With Bachelor Degrees	Full Time Tenured Faculty	0	0	0	0	0	0	
	Full Time Tenure Track	0	0	0	0	0	0	
	Full Time Career Line/Adjunct Faculty						0	
	Part Time Tenure/Tenure Track							
	Part Time Career Line/Adjunct Faculty			0	0	0	0	
	Total	0	0	0	0	0	0	
Total Headcount Faculty	Full Time Tenured Faculty	4	3	3	3	3	3	3
	Full Time Tenure Track	1	1	1	2	2	2	1
	Full Time Career Line/Adjunct Faculty						2	
	Part Time Tenure/Tenure Track							
	Part Time Career Line/Adjunct Faculty			1	1	3	1	1
	Total	5	4	5	6	8	8	5

Cost Study

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Direct Instructional Expenditures	555,094	534,506	673,357	643,354	794,280	789,077	743,314
Cost Per Student FTE	17,683	13,136	14,884	11,019	11,381	10,957	12,075

FTE from Cost Study

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Full-Time Salaried	5	4	5	5	5	6	7
Part-Time or Auxiliary Faculty	0	0	1	1	1	1	3
Teaching Assistants							

Funding

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Total Grants	373,293	323,653	444,431	514,378	553,854	475,535	399,537
State Appropriated Funds	551,493	516,434	428,399	532,538	570,084	639,237	541,336
Teaching Grants	0	0	0	0	0	0	0
Special Legislative Appropriation*							
Differential Tuition*							

A.

Student Credit Hours and FTE

		2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
SCH	Lower Division	290	322	493	565	579	523	511
	Upper Division	489	685	581	818	1,097	1,180	957
	Basic Graduate	92	100	160	193	193	233	203
	Advanced Graduate	17	43	30	53	86	72	50
FTE	Lower Division	10	11	16	19	19	17	17
	Upper Division	16	23	19	27	37	39	32
	Basic Graduate	5	5	8	10	10	12	10
	Advanced Graduate	1	2	2	3	4	4	2
FTE/FTE	LD FTE per Total Faculty FTE	2	2	3	3	3	3	2
	UD FTE per Total Faculty FTE	3	5	3	5	6	6	3
	BG FTE per Total Faculty FTE	1	1	1	2	2	2	1
	AG FTE per Total Faculty FTE	0	0	0	0	1	1	0

Enrolled Majors

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Undergraduate Pre-Majors	14	21	23	26	26	25	16
Undergraduate Majors	31	39	45	59	74	70	70
Enrolled in Masters Program	5	6	7	8	10	13	13
Enrolled in Doctoral Program	2	2	4	4	5	4	3
Enrolled in First Professional Program							

Degrees Awarded

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Undergraduate Certificate							
Graduate Certificate							
Bachelors	5	14	9	12	9	15	20
Masters		2	3	3	2	2	7
Doctorate	1	1			2	3	1
First-Professional							

Memorandum of Understanding
Department of Mining Engineering
Graduate Council Review 2016-17

This memorandum of understanding is a summary of decisions reached at a wrap-up meeting on June 12, 2017, and concludes the Graduate Council Review of the Department of Mining Engineering. Ruth V. Watkins, Senior Vice President for Academic Affairs; Darryl P. Butt, Dean of the College of Mines and Earth Sciences; Michael G. Nelson, Chair of the Department of Mining Engineering; David B. Kieda, Dean of the Graduate School; and Katharine S. Ullman, Associate Dean of the Graduate School, were present.

The discussion centered on but was not limited to the recommendations contained in the review summary report presented to the Graduate Council on April 24, 2017. The working group agreed to endorse the following actions:

Recommendation 1: Institute a mentoring committee for each junior faculty member that would advise the new faculty on the competing demands of teaching, research and service, and assist with finding funding opportunities, applying for grants, and understanding the RPT process and requirements.

The Department is committed to robust mentorship of junior faculty and is taking an individualized approach that is less formal than a mentoring committee. This was viewed by those present as an effective and appropriate strategy. Mentoring tactics in place include regular opportunities to meet with Dean Butt, as well as annual meetings with the Department Chair. Opportunities are being sought to involve faculty in mentoring beyond the Department and even the College. For instance, the Chair has looked for specific research opportunities that connect departmental faculty with faculty in other departments. In addition to fostering a cohort/network model of mentoring informally, the College is initiating faculty mentoring plans that will provide further opportunities. An effort on main campus to provide mentoring support specifically aimed at facilitating grant applications is being developed and will provide another arm for mentoring support. Dean Kieda mentioned the value of having junior faculty serve on university-wide committees as an opportunity to further widen their network, as long as such service does not become overly burdensome.

Recommendation 2: Improve graduate and undergraduate student advising through the appointment of a dedicated professional advisor.

SVP Watkins articulated strong commitment to the development of a robust advising resource. She envisions future investment and collaboration in a College-wide approach that brings more service to more people, to maximize and professionalize this effort. To this end, Dean Butt has appointed a manager of student success, who will help coordinate College-wide advising, and remodeling of space dedicated to an Advising Center is about to begin. Within the Department, an administrative assistant has been assigned to support a staff member who currently helps with advising. Finally, undergraduates are linked to the three new faculty members for academic advising, with the Chair specifically guiding senior students. With the evolution underway in student advising, updates to the Graduate School should include assessment of student satisfaction and success (e.g., time to degree, completion rates, and placement), at both the undergraduate and graduate level.

Recommendation 3: Strengthen the graduate program through an increase in the number of graduate students and research funding to support them. Establish innovative core graduate courses and set specific learning outcomes. Update and make available the graduate handbook. The recent hire of three new faculty in exciting areas makes the growth promising. Partnership on graduate offerings with other departments and universities is encouraged.

With several new faculty now in the Department and further recruitments planned, measured expansion of the graduate student population is anticipated, along with increased research funding. The Department is taking several steps to attract and support graduate students. An updated graduate handbook is expected to be complete by Fall semester 2017. The group discussed the importance of including policies for family leave, orderly dismissal, and switching advisors. These must be consistent with legal requirements and University policy, but often need to have some discipline-specific customization (a link to examples was provided after the meeting). Developing College-wide policies was encouraged. A curriculum review is being conducted, and a plan for core graduate coursework is a current focus that is expected to be complete by the end of the 2017-18 academic year. The Chair's written response also described innovative new courses already being offered. In addition, an interdisciplinary master's degree in Earth Resource Management is being planned.

Recommendation 4: Increase the national and international visibility of the Department by taking leadership roles in professional organizations and publishing research in peer-reviewed, high-impact journals beyond the mining profession.

Senior members of the Department are established and active members of professional organizations, so in this regard, the emphasis of future actions will be on continuing this tradition and instilling the importance of this service on new faculty members, as well as helping to facilitate their involvement and visibility. When

the importance of publishing in peer-reviewed, high impact journals was discussed, Chair Nelson agreed that there are opportunities for publishing in widely circulated journals and concurred that external reviewers were highlighting an expectation of their standards for supporting retention and promotion actions. To provide concrete information on this point, the Chair will share with new faculty a list of journals that has been put together by the Society of Mining Professors. In general, this recommendation ties into the mentorship discussed in the context of Recommendation 1 above, and new faculty should be encouraged to seek advice from colleagues within the Department and from related disciplines on strategies for publication.

Recommendation 5: Staff the Department with a dedicated laboratory technician to keep up with the demands of teaching labs and research projects. Assign resources to keep and upgrade the website and mining software needed by the Department.

A valued and experienced Research Device Specialist currently employed by the College has the skills and knowledge to maintain equipment important for teaching and research laboratories. Setting clear expectations and tracking whether maintenance is effectively done will be the goals going forward, but to fully address this need, the Department will continue to request funding for a laboratory technician dedicated solely to the Department. The website is a College-wide priority and the Dean's office has dedicated resources to making improvements. This has been focused first on an intranet, and attention is next turning to external appearances. In addition, there have been ongoing efforts to increase traffic on the website, and the number of hits tripled in the last year. Sustaining a fresh and informative web interface will be an ongoing priority. The Chair felt that support for mining software was stable and that it is kept up to date appropriately. Again, ensuring that this core resource remains at this level is the longer term goal.

Recommendation 6: Develop a formal strategic plan that includes hiring at mid-level positions in view of the imminent retirement of senior faculty. Consider diversifying research directions that lead to an increase in funding for research. Partner with the College to develop funding strategies to upgrade laboratory equipment.

With a small cadre of faculty, the Department plans strategically through ongoing conversation. In the coming academic year, a formal plan will be articulated in a written document, with its completion expected by July 2018. Such a document will help solidify departmental priorities; however, actions are already being taken to address the specific point that Department demographics would benefit from hiring at mid-level. A current faculty search is underway, with promising candidates who are at such a level. Filling the endowed chair in Mine Safety is another opportunity recognized to help in this area. Regarding laboratory equipment, Chair Nelson felt that external reviewers had a misperception of its condition, which he states is in good

shape. He also felt that equipment needs are supported by the College. That said, other mechanisms may be needed to take advantage of future opportunities for growth in new areas (such as drones and robotics), and the possibility of partnering with industry was discussed as one option.

Overall, the Department was commended for responding constructively to these recommendations and Dean Butt was gratefully acknowledged for creating many positive changes in a short time and for solving problems through broad engagement.

This memorandum of understanding is to be followed by regular letters of progress, upon request of the Graduate School, from the Chair of the Department of Mining Engineering. Letters will be submitted until all of the actions described in the preceding paragraphs have been completed. In addition, a three-year follow-up meeting may be scheduled during AY 2019-20 to discuss progress made in addressing the review recommendations.

Ruth V. Watkins
Darryl P. Butt
Michael G. Nelson
David B. Kieda
Katharine S. Ullman

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David B. Kieda
Dean, The Graduate School
September 5, 2017