June 9, 2014

Provost Paul DeLuca, Jr.
Dean Martin Cadwallader

Re: Review of the Geological Engineering Master of Science and PhD degree programs

Dear Provost DeLuca and Dean Cadwallader:

The College of Engineering has completed the review of the Geological Engineering Master of Science and Doctor of Philosophy degree programs. The Geological Engineering (GLE) department at UW-Madison is a virtual department that is administered by the Civil and Environmental Engineering Department and is resourced jointly by the College of Engineering and College of Letters and Sciences. The program consists of about 89 undergraduate students and 15 graduate students with 13 core faculty, four affiliate faculty and two adjunct faculty. Most of the core faculty have dual roles between GLE and the department of their tenure home which typically is Geosciences or Civil and Environmental Engineering. The review of the GLE graduate degree programs was conducted by an internal UW review committee consisting of Profs. Shiyu Zhou (chair), Paul Campagnola, and Kevin Shinners (Biological Systems Engrg) on behalf of the Graduate School. This committee reviewed the program self-study (attached) and met with the chair of the department, the assoc. chair for graduate studies, 6 faculty and 9 GLE graduate students in compliance with a previously approved college graduate program review process. The College of Engineering Graduate Program Review Committee considered the report of the review committee and approved it with revisions on April 14, 2014 (attached). The report was then shared with the GLE Program who accepted the report and recommendations with a written response (attached). The College of Engineering Academic Planning Council considered the report on May 14th, 2014 and recommended acceptance of the report with its recommendations.

The review subcommittee had 7 recommendations which can be paraphrased as follows:

- GLE should develop a strategic plan that provides a roadmap for resolving issues of undergraduate enrollment growth, financial resource limitations, and operations that intersect the colleges/departments involved.
- Develop a clarification of responsibilities and commitment between the GLE department and the Geosciences department.
- Resolve the issue of no dedicated tenure lines for GLE and the impacts this has on the degree programs at the undergraduate and graduate levels.
- Establish and implement more structured assessments of the GLE graduate program.
- Establish clear policy and procedures for handling graduate student grievances and include them in the GLE handbook.
- Include graduate students in departmental committee activity.
• Efforts should be directed toward improving student diversity of the graduate programs.

The overriding issue identified as part of the review of the graduate programs is the need for a strategic plan and operational model for the future GLE that clearly articulates the commitment and support obligation between the College of Engineering, the College of Letters and Sciences and the departments involved. The College of Engineering will work with the Geological Engineering Department to address these recommendations. We ask that the GFEC, the UAPC and your office accept this program review in fulfillment of our campus obligation.

Sincerely,

Steven M. Cramer, PhD, PE  
Associate Dean of Academic Affairs and Professor  
College of Engineering  
University of Wisconsin-Madison  
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608-262-3484

Cc:  Dean I. Robertson
     Dean K. Scholz
     Prof. C. Benson, Chair, Geological Engineering
     Assoc. Provost J. Milner
     Asst. Dean K. Haslam

Att:  GLE Self Study
     GLE Review Report
     GLE Response
MEMORANDUM

To: Parmesh Ramanathan, Professor, Dept. Electrical and Computer Engineering

From: William J. Likos, Associate Professor and Graduate Program Chair
      Craig H. Benson, Wisconsin Distinguished Professor and Chair

Date: 09 April 2014

Re: GLE Response to Graduate Program Review

Cc: Steven Cramer, Associate Dean for Academic Affairs, College of Engineering

We have received a copy of the Graduate Program Review Report dated April 8, 2014 prepared by the program specific review committee (Prof. Shiyu Zhou, Chair). We thank the committee for its efforts and will work to implement the recommendations in the near future. The main actionable recommendations are the following:

- Provide broader course selection and lab innovation;
- Continue to provide a formal new graduate student orientation;
- Establish more structured assessments of the program, e.g. student learning outcomes, to address potential accreditation in the future;
- Articulate in the graduate student handbook the policies and procedures to resolve grievances between graduate students and their major professor, GLE staff or fellow students;
- Foster graduate student participation on appropriate departmental committees;
- Continue efforts to increase the diversity of the student population.

We agree that the issues regarding resource allocation and tenure lines need to be addressed in GLE. They are relevant to the undergraduate program as well as the graduate program and are necessary for more transparent accounting of the research enterprise. As part of a separate effort unrelated to the Graduate Program review, GLE has embarked on a process to develop a more formal administrative structure within both the College of Engineering (CoE) and the College of Letters and Science (L&S). This structure will provide clarity in resource allocation processes for GLE from CoE and L&S, address issues related to tenure lines and faculty resource allocation, and provide greater clarity in the role of the Department of Geoscience in deploying the undergraduate and graduate curricula.

Sincerely,

William J. Likos
Craig H. Benson
Report of the Committee for a 10-Year Review of Masters and Ph.D. Degrees in Geological Engineering

May 8, 2014

Committee Members:

Shiyu Zhou, Chair
Department of Industrial and Systems Engineering
University of Wisconsin, Madison

Paul Campagnola
Department of Biomedical Engineering
University of Wisconsin, Madison

Dr. Kevin J. Shinners
Department of Biological Systems Engineering
University of Wisconsin, Madison

1. Introduction

College of Engineering Associate Dean Steve Cramer charged the above committee in February 2014 to conduct 10-year review of the Masters and doctoral program in Geological Engineering (GLE). In addition to the policy-mandated issues in the 10-year review, Associate Dean Cramer requested the committee to consider the following questions:

- Please clarify the relative balance of GLE graduate student activity in Geosciences versus Engineering? Where is the primary home of the courses they take? Are individual students primarily in one department versus the other or do they take courses in each department and perhaps others on campus? How do the students distribute by major professor in the past several years?

- Are the number of students in the graduate program comparable to norms in engineering and geosciences? Are the numbers increasing, decreasing or holding steady?

- Please identify the learning outcomes for the GLE graduate program. Are these learning outcomes assessed or is there a plan to assess them? This is asked because all graduate level programs will be required to have learning outcomes as the campus prepares for the next accreditation visit.

- What distinguishes the graduate degrees in GLE in terms of specialization and future career directions from others in Engineering and in Geosciences?

2. Background

The Geological Engineering (GLE) program evolved from Mining Engineering, which was closed in 1980. GLE was established in 1988 as a “virtual” department within the College of
Engineering, but with a strong relationship with the College of Letters and Science. As a “virtual” department, GLE has all of the responsibilities and governance structures of a department. The GLE program was initially administrated through the Department of Material Science and Engineering. In 1999 and since then, its administrative support has been through the Department of Civil and Environmental Engineering.

The GLE graduate program was implemented in fall 1994. The number of enrolled graduate students (MS and PhD) has been stable at around 10 per year in the last ten years. In the last two years, there has been a significant increase in enrollment. At present, there are around 20 graduate students in the program. These students come from diverse multidisciplinary backgrounds.

The review committee met collectively with GLE department chair Professor Craig Benson and Associate Chair for Graduate Studies Associate Professor William Likos. Individual interviews (one on one) were conducted with faculty members Associate Professor Steven Loheide II, Professor Basil Tikoff, Assistant Professor Jim Tinjum, Assistant Professor Mike Cardiff, Associate Professor Dante Fratta, and also staff member Sabrina Bradshaw, representing both the Civil and Environmental Engineering and Geosciences Departments. A collective meeting of the committee was held with 9 graduate students in the GLE program.

3. Findings

- GLE program has 13 core faculty members, 4 affiliated faculty members, and 2 adjunct faculty members and a couple of support staff members. The faculty members have excellent research accomplishments.
- GLE graduate students have a special blend of expertise in engineering and geoscience. Other engineers, such as civil and environmental engineers with a geotechnical emphasis, are considered weak in their understanding of geological processes and structures that are critical to engineering in the earthen environment. Similarly, geoscientists are considered weak in terms of their quantitative predictive skills that are essential to many industrial activities. GLEs have very special roles in the energy industry (e.g., oil, gas, geothermal), resources industry (mining and minerals), and geoenvironmental industry (groundwater protection and treatment) that are not fulfilled by other disciplines.
- Since the GLE graduate degree is not offered in most North American peer institutions, commonly cited program rankings such as US News and World Report do not include GLE. However, in a lesser known ranking system, the GLE program at UW Madison ranks very high. For example, the Chronicle of Higher Education ranks GLE at UW Madison second. This indicates that the research programs of GLE faculty are strong and the graduate students are able to access cutting edge research.
- Currently there are 20 graduate students enrolled in the GLE program, among which 16 have their primary professor in the Civil and Environmental Engineering Department and 4 in the Geosciences Department. All these students have some form of financial support such as a research assistantship and/or teaching assistantship. Most of the TA support is provided to support GLE courses. Majority of GLE students are pursuing a Master’s degree (76%).
- The structure of the MS and PhD programs are described in a graduate handbook available online through the GLE department website. Due to the interdisciplinary nature of the
program and the diverse background of the students, the MS and PhD programs do not have a common fixed set of core course requirements. Instead, only a certain number of graduate credits are required for MS and PhD program, respectively. The mentoring committee designs a specific curriculum for each student according to their prior academic preparation and their specific research interests. That being said, a few graduate level GLE courses have become the de facto common core for the graduate students in the program.

- The GLE students associate themselves mostly strongly with the College of Engineering. In other words, they consider themselves as engineers. There is a strong sense of community among the GLE students. Besides regular curriculum activities, they have multiple social events and gatherings each year, both onsite and offsite. A formal graduate student organization was established this year, although it is unclear they have a dedicated faculty adviser.
- The number of international students in the program has increased considerably in the last two years and now makes up 59% of the total enrollment. The College of Engineering average is about 35%.
- The GLE graduate student enrollment is small, so a change of only one or two students has a great impact on diversity statistics. Female or ethnic students from the US make up less than a third of the total.
- The average time to graduation for PhD students is 5.4 years, which is common for many programs in COE.
- The GLE graduates have found employment opportunities in both industry and academia. The students who graduated through the program in recent years have all landed very good positions.
- The graduate students did not raise any major concerns. They seem to be satisfied with the program, policies, and procedures that they have experienced. However, they did not know the program procedures for handling student grievances. Also, they suggested that broader course selection, lab innovation, and a formal new graduate student orientation could benefit the program.
- Although GLE is a virtual department in the sense that most of the faculty members are volunteers, the department operates very much as a regular department. For example, there are monthly faculty meetings and department committees for decision making. This indicates that the members from both the Civil and Environmental Engineering and Geosciences departments value the existence of the program and are willing to contribute their time and energy into the program. A high degree of satisfaction with the program leadership was expressed by the individual faculty.
- The faculty expressed the need for more TA’ships for the graduate students in the program to help with their rapidly increasing undergraduate teaching loads.

4. Recommendations related to GLE programs

- Currently GLE operates under a “virtual” department model. This model works fine when the student number is limited. However, with growing enrollment (especially the undergraduate program), the operation under this model becomes difficult. The committee recommends that GLE works soon to formulate a detailed strategic plan that aligns the undergraduate and graduate enrollment with the available and expected resources.
• A recurrent topic mentioned during the meetings with GLE is the relationship with the Department of Geosciences in the College of Letters and Science. The increasing enrollment in GLE strains the currently available resources of GLE and Geosciences and creates some friction between them. Currently, the responsibilities are vague and many people just contribute voluntarily based on their belief in the importance of the interdisciplinary GLE program. The committee recommends a clarification of the responsibilities and commitment between GLE and Geosciences, with an explicit arrangement be developed to avoid the degradation of the relationship. This is necessary for the sustained development and growth of GLE.

• One challenge faced by GLE is the lack of tenure lines within the program (outside of the Civil and Environmental Engineering and Geosciences Departments) because of its “virtual” department model. This issue critically limits the growth of the GLE program. Without dedicated tenure lines, GLE will always need to depend on other departments in hiring new faculty members. The committee recommends a careful assessment of the need of tenure line within GLE be performed and use this assessment to guide this process of their potential establishment.

• The committee recommends that GLE establish more structured assessments of the program, e.g. student learning outcomes, to address potential accreditation in the future.

• Although the GLE handbook is very good and readily available to the students, a section should be included that clearly articulates the policies and procedures to resolve grievances between graduate students and their major professor, GLE staff or fellow students.

• Graduate student participation on appropriate departmental committees should be considered to foster greater student input.

• Efforts should be considered to increase the diversity of the student population.