




UNIVERSITY OF WYOMING

WORKING FOR WYOMING & THE WORLD

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Date: 26 August 2016

To: Kate Miller, Provost and Vice President of Academic Affairs
Anne Alexander, Associate Vice President of Academic Affairs

From: Michael V. Pishko 
Dean, College of Engineering & Applied Science

RE: Civil Engineering Program Review

As per instructions from Academic Affairs, the Civil Engineering Ph.D. program has been reviewed. This program is administered by the Department of Civil & Architectural Engineering. Pursuant to UW guidelines for program review, I recommend the program mentioned above be retained as mission critical. The civil engineering program meets basic workforce and economic development needs for the State of Wyoming, supporting agencies such as WyDOT and numerous civil engineering firms across the state. In addition, water resource engineering and management, supported by civil engineering, has been identified as a key research area by the Tier 1 Engineering Initiative as created by the Wyoming State Legislature and Governor's office. This graduate program also serves the research needs of WyDOT in the transportation area. As such, the program should be retained and enhanced to support the state's economic interests.

It should be noted that the department is making a concerted effort to increase the number of students in this program.

cc: Anthony Denzer, Steve Barrett, Megan Barber, File

Academic Program Review
Report Template
University of Wyoming
Office of Academic Affairs
March 2016

(adapted from SDSU)

Deans and Directors who administer an authorized major or course of study approved by action of the Board of Trustees will be responsible for conducting program reviews. Four key elements should be addressed in each academic program review: (1) Program Demand, (2) Program Quality, (3) Mission Centrality, and (4) Cost.

For each program that is reviewed, a recommendation will be made by the Academic Dean to the Vice President of Academic Affairs.

Instructions: Please provide the following information:

Title of Program/Specialization: **Civil Engineering/Ph.D.**

Indicate whether undergraduate
or graduate program/specialization: **Graduate**

Department and College: **Civil & Architectural Engineering
Engineering and Applied Sciences**

Department Head: **Anthony Denzer
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Part 1 – Program Review

1. Program Demand*:

a. Number of graduates over 5-year period:

2010-11	2011-12	2012-13	2013-14	2014-15	Total
1	1	1	6	1	10

b. Enrollment in major/specialization over 5-year period:

2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
14	10	13	11	15	20

2. Program Quality: Is the program of high quality?

a. Program accreditation

Ph.D. in Civil Engineering is Not accredited; none available.

b. Credentials of faculty

Credentials of Faculty				
Name		Highest Degree	Area	Gender
Mohamed	Ahmed	PhD	Transportation	Male
Michael	Barker	PhD	Structures	Male
Jonathan	Brant	PhD	Environmental	Male
Shawn	Griffiths	PhD	Geotechnical	Male
Johnn	Judd	PhD	Structures	Male
Khaled	Ksaibati	PhD	Transportation	Male
David	Mukai	PhD	Structures	Male
Kam	Ng	PhD	Geotechnical	Male
Fred	Ogden	PhD	Water	Male
Nori	Ohara	PhD	Water	Male
Gang	Tan	PhD	Architectural	Male
Jennifer	Tanner	PhD	Structures	Female
Michael	Urynowicz	PhD	Environmental	Male
Liping	Wang	PhD	Architectural	Female
Jianting	Zhu	PhD	Water	Male

Name		Previous 5 Years (2011 to 2015)			
		Grants Awarded	Grants Submitted	Pub's/Present's	Nat'l/Int'l Awards
Mohamed	Ahmed	13	8	59	3
Michael	Barker	5	n/a	67	0
Jonathan	Brant	16	16	30	3
Shawn	Griffiths	0	0	5	2
Johnn	Judd	1	4	47	0
Khaled	Ksaibati	46	n/a	115	0
David	Mukai	1	8	1	0
Kam	Ng	14	18	31	3
Fred	Ogden	6	14	67	3
Nori	Ohara	7	10	21	2
Gang	Tan	8	27	20	0
Jennifer	Tanner	4	5	19	1
Michael	Urynowicz	8	14	27	2
Liping	Wang	10	15	14	0
Jianting	Zhu	11	15	131	1
	Total	150	154	654	20

c. Program reputation

Not ranked/Not aware of any rankings.

Program reputation at this level is probably less important than individual faculty reputation; i.e., doctoral students are drawn to work with specific people on specific cutting-edge topics. We have several faculty who are nationally and internationally prominent as seen in answer b. above. Some younger faculty are well on the trajectory to such prominence.

d. Curriculum of major or specialization

Each student's Program of Study is developed with the Faculty Advisor. There are no required or 'core' courses for the Ph.D. program.

We offer the following graduate-level courses (for both M.S. and Ph.D. students):

Water Resources		
CE	5300	Open Channel Hydraulics
CE	5310	Hydraulics of Closed Conduits
CE	5330	Design of Hydraulic Structures
CE	570V	Hydrologic Remote Sensing
CE	570X	Hydrometeorology
CE	570Y	Deterministic Hydrologic Modeling
CE	570Z	Paleo-Hydroclimatology
CE	5810	Groundwater Hydrology
CE	5830	Flow in Porous Media
CE	5880	Advanced Hydrology
CE	5300	Open Channel Hydraulics

Geotechnical Engineering		
CE	5620	Design of Earth Retaining Structures
CE	5820	Design of Small Earth Dams
CE	5610	Advanced Foundation Engineering
CE	5700	Advanced Soil and Rock Slope Engineering
CE	5710	Geotechnical Engineering
CE	5640	Geotechnical Earthquake Engineering

Environmental Engineering		
CE	5400	Advanced Water Treatment
CE	5410	Advanced Biological Wastewater Treatment
CE	5425	Environmental Engineering Microbiology
CE	5430	Environmental Engineering Chemistry
CE	5435	Environmental Transport Processes
CE	5440	Hazardous Waste Management Engineering
CE	5445	Hazardous Waste Site Remediation
CE	5450	Advanced Physical-Chemical Treatment
CE	5455	Project Management for Environmental Engineers

Structural Engineering		
CE	5010	Advanced Mechanics of Materials
CE	5200	Advanced Structural Analysis
CE	5220	Structural Dynamics
CE	5255	Advanced Steel
CE	5260	Prestressed Concrete Design
CE	5270	Highway Bridge Design
CE	5290	Earthquake Engineering
CE	5295	Structural Timber Design
CE	5285	Masonry Design

Transportation Engineering		
CE	5560	Traffic Safety
CE	5570	Transportation Planning
CE	5575	Intelligent Transportation Systems
CE	5585	Pavement Management Systems
CE	5590	Pavement Materials
CE	5510	Pavement Design for Airports and Highways
CE	5555	Geometric Design of Highways
CE	5530	Traffic Engineering: Operations

Architectural Engineering		
ARE	5295	Structural Timber Design
ARE	5285	Masonry Design
ARE	5400	Building Energy Management
ARE	5600	Collaborative BIM Design
ARE	5700	Architectural Engineering Problems

e. Distance delivery of program/major
Program is not offered online or by distance delivery.

f. Quality of Assessment Plan/data

In July 2016 we submitted a Tier 2-Assessment of Student Learning Outcomes Report to UW Academic Affairs. We have not received feedback on it yet.

It includes the following Student Learning Outcomes:

When students complete a Ph.D. they will be able to:

- 1. Complete coursework successfully (assessed by thesis committee).*
- 2. Complete degree in timely fashion (assessed by thesis committee).*
- 3. Conduct publishable research in the field (assessed by thesis committee).*
- 4. Demonstrate a broad knowledge of theory and research across the field (assessed by thesis committee).*
- 5. Demonstrate in-depth knowledge of at least one area of expertise (assessed by thesis committee).*
- 6. Think originally and independently (assessed by thesis committee and advisor).*

7. *Synthesize existing knowledge, identifying and accessing appropriate resources and other sources of relevant information and critically analyzing and evaluating one's findings and those of others (assessed by dissertation committee and advisor).*
8. *Master application of existing research methodologies, techniques, and technical skills (assessed by thesis committee and advisor).*
9. *Follow ethical standards and practices in the field (assessed by advisor).*
10. *Write and speak effectively to professional audiences about your research and issues in the field (assessed by thesis committee and advisor).*

So far we have collected a limited amount of assessment data. This data will be shared and discussed with the Civil Engineering faculty in Fall 2016.

In the future as we gather more assessment data, we plan to use this data to strengthen the program quality and student learning.

g. Strategic Plan

- **The Engineering Initiative (WyGEESIT) calls for “World-Class Research and Graduate Education” and sets the following expectations for Engineering faculty:**
 - **Graduate students supervised: 5/faculty/yr**
 - **Research expenditures: \$250K/faculty/yr**
 - **External proposals submitted: 6/faculty/yr**
 - **Percentage of proposals awarded: 20%**
- **The High Bay Research Facility (\$50 million) opens in January 2016. It includes a two-story Structural Engineering laboratory with a 2500 square-foot strong floor and a 21-foot-tall reaction wall. This space is dedicated to Civil Engineering and graduate-level experimental research in the Structures and Geotechnical areas.**
- **The Engineering Education and Research Building (EERB) is in design with groundbreaking in October 2016. It will support graduate-level research with space to be allocated on a merit basis.**
- **In 2015-16 Civil Engineering received a Graduate Research Initiative (GRI) award to support travel for targeted recruits. This was completed successfully and several students were recruited.**
- **In 2014-15 Civil Engineering received a GRI award to produce well-designed websites for individual faculty researchers. This was completed successfully and had a noticeable impact on quality and quantity of applicants to the program.**

h. Other:

Enrollment figures will continue to grow, because we have a total of 4 new Assistant Professors in 2015-16 and 2016-17. They are expected to be highly productive in doctoral research. They have replaced retiring senior faculty who were relatively inactive in doctoral research.

3. Mission Centrality: Does the program advance the mission of UW including institutional strategy?

a. Describe how the program supports the mission, vision and strategic goals of UW.

- **See points about the Engineering Initiative (WyGEESIT) above.**
- **Centers led by Civil Engineering faculty include:**
 - **Center for Computational Hydrology and HydroSciences, Dr. Fred Ogden**
 - **Center for Excellence in Produced Water Management (CEPWM), Dr. Jon Brant**
 - **Center for Biogenic Natural Gas Research, Dr. Michael Urynowicz**

b. Describe how the program contributes to other programs across campus (i.e., general education courses, minor or support courses, interdisciplinary program, etc.)

There is strong synergy between Civil Engineering and:

- **School of Energy Resources (cross-listed courses)**
- **Haub School/ENR (1 joint-appointed faculty)**
- **WyCEHG**
- **Geology and Geophysics (1 joint-appointed faculty)**
- **Chemical Engineering (cross-listed courses)**
- **Mechanical Engineering (cross-listed courses)**
- **Statistics**

c. Include placement data for graduates and indicate if graduates are working in the field or not.

No data available.

d. Describe the uniqueness or duplication of this program across the UW.

The program is unique. The discipline of Civil Engineering explicitly addresses infrastructure and the built environment, and focuses on applied solutions to social problems which enhance the standard of living worldwide. No other program at UW has this disciplinary identity and focus.

e. Other:

- **There are 20+ students current enrolled in the Ph.D. in Civil Engineering.**
- **Most of them are supported by grants.**
- **There would be no savings by eliminating this program. The same number of faculty/staff would be required to deliver the B.S. and M.S. programs (not in review).**
- **Practically all of the faculty have been recruited specifically to supervise doctoral-level research. If this program is eliminated, it is likely that the faculty would leave UW in great numbers.**
- **Some external funding agencies require that projects have doctoral-level research and doctoral student supervision.**

4. Cost: Is the program financially viable?

It is not possible to provide the data requested on instructional expenditures, since resources which support the Ph.D. program can not be isolated from the B.S. and M.S. programs, or from other programs on campus. All Civil Engineering faculty teach a mix of undergraduate and graduate courses. Many courses are cross-listed at the 4000/5000 levels. All graduate-level courses are populated by MS and Ph.D. students. Many Ph.D. students from other disciplines take classes offered by Civil Engineering faculty and conversely many Civil Engineering graduate students take classes offered in other units.

Additionally, true research expenditures are not known because of poor tracking by the research office. We think our research expenditures for 2015-16 were about \$2.5 million. This is about \$167,000 per faculty FTE who participate in the Ph.D. program.

Part II - Recommendations

Instructions: After the review is completed, the Dean in consultation with the Department Head will select one of the following recommendations. In the justification, address each of the items associated with the recommendation.

1) Retain Due to Critical Need

- a) A college may recommend that a degree program be retained due to its ability to fulfill a critical workforce need or shortage area for the state.
- b) Justification for retaining due to critical need must include:
 - i) Explanation of why the program is important to the University/State/region
 - ii) Description of specific steps (already taken and/or planned) to increase enrollment and graduate production;
 - iii) Preliminary outcomes of steps taken.

2) Retain with Further Review Required

- a) A college may request that a program be retained for further review for those degree programs that serve a specific function central to the mission of the college or university.
- b) Justification for retain due to further review must include:
 - i) Explanation for how the program is central to the university's mission and the benefit to the system;
 - ii) Description of specific steps (already taken and/or planned) to increase enrollment and graduate production;
 - iii) Preliminary outcomes of steps taken.

3) Consolidate with Another Program within College

- a) A college may request that a program be consolidated with a similar program on campus that achieves similar degree requirements.
- b) Justification to consolidate with another program on campus must include:
 - i) Explanation for how the degree requirements for the two programs warrant consolidation;
 - ii) Evidence that the consolidation will meet graduate production thresholds, or specific steps to increase enrollment to meet production thresholds;
 - iii) Preliminary outcomes of steps taken.

4) Consolidate with Program(s) between Colleges/campuses (e.g., UW/C)

- a) Two or more colleges may request that similar degree programs be consolidated to maintain equivalent degree programs.
- b) Justification for retaining due to cross-college consolidation must include:
 - i) Explanation for how the consolidated programs will collaborate (e.g., sharing of required courses, shared faculty, etc.) to maintain graduate production thresholds;

- ii) Evidence that multi-college collaboration will meet graduate production thresholds, or specific steps to increase enrollment if merging programs fails to meet production thresholds;
- iii) Preliminary outcomes of collaboration between colleges.

5) Terminate

- a) A college may request that a program be terminated due to limited graduate production, lack of student interest, shifts in a given field of study, or continued declines in major enrollments.
- b) If the exigency for termination results from the program productivity review process then a brief justification to terminate a program should be included. Such a justification must include:
 - i) Explanation for the decline in graduate production in the degree program;
 - ii) Intended timeframe for submitting a program termination request to the Board of Trustees for their consideration;
 - iii) Expected timeline to meet teach-out requirements established through the regional accrediting body.

APPENDIX A

“Low Productivity” Programs Excluded from Review Process

- 1) **Major Program Modifications**
 - a) Degree programs that have undergone recent program modifications that adversely impact graduate production for a college.
 - b) Modifications traditionally include programs that have undergone recent name changes during the reporting window that result in two equivalent degree programs.
- 2) **Program/Major Specializations**
 - a) Degree programs that have one or more specializations which reduce the total number of graduates.
 - b) The exclusion may apply only for those specializations where the combination results in graduate production that meets the established threshold for the degree.
- 3) **Terminated Programs**
 - a) Degree programs that have been inactivated during the reporting period, but still depict graduates that fall below the established thresholds.
 - b) Terminated programs will remain on the Program Productivity Report until inactive programs have completely cycled through the established reporting period.
- 4) **New Programs**
 - a) Degree programs that have been activated within the past 7 years resulting in limited graduate production due to program implementation.
 - b) Institutional review may be requested prior to the 7th year if graduate production is not scaling to the required thresholds for the degree level.