Graduate Program Review
Texas Tech University

Program Reviewed: Chemical Engineering Graduate Program

Onsite Review Dates: February 24-26, 2014

Name of Reviewers

Internal:
W. Andrew Jackson
Professor
Associate Chair and Graduate Advisor
Department of Civil and Environmental Engineering

Carol Korzeniewski
Professor and Chair
Department of Chemistry

Jonathan Maul
Associate Professor
Department of Environmental Toxicology

External:

Please include name, title, and Department
W. Robert Ashurst, PhD
Associate Professor
Associate Department Chair
Undergraduate Program Chair
Chemical Engineering at Auburn University

Kimberly Ogden, PhD
Professor
Department of Chemical and Environmental Engineering
University of Arizona

I. Academic Unit Description and Strategic Plan

Please evaluate the following:
II. Program Curriculum

Please evaluate the following:

Alignment of program with stated program and institutional goals and purposes
    __ Excellent _X_ Very Good __Appropriate __Needs Improvement __N/A

Curriculum development coordination and delivery
    __ Excellent __ Very Good __Appropriate _X_Needs Improvement __N/A

Program learning outcomes assessment
    __ Excellent __ Very Good _X_Appropriate __Needs Improvement __N/A

Program curriculum compared to peer programs
    __ Excellent __ Very Good _X_Appropriate __Needs Improvement __N/A

Please elaborate if you have identified any items in this section as Excellent.

The Chemical Engineering Department is doing an excellent job in becoming a top 50 research program contributing to the university goal of becoming a Tier 1 University.
Please elaborate if you identified any items in this section as Needs Improvement. Provide recommendations in the area of Program Curriculum.

Curriculum Delivery - Currently, non-traditional students are required to take the core curriculum with no leveling courses. Admitted students with non-traditional backgrounds (i.e., those students that do not have chemical engineering backgrounds) need a tailored “remediation” plan that could involve undergraduate coursework or other preparation. Applicants that the department intends to admit should have the remediation plan clearly explained prior to admission, and the department needs to develop a policy regarding admission and student support standards for applicants with non-traditional backgrounds. This is potentially more relevant in view of the need to expand the size of the graduate program and add diversity to the research themes, where traditionally prepared applicants may be insufficient in number or skillset to fulfill future admission needs.

Other comments (optional)
The Chemical Engineering Graduate Curriculum seems very standard and appropriate for the discipline. The TTU curriculum model is consistent with that of peer institutions in terms of number of core courses and core course content. The learning outcomes seem to be assessed appropriately but it is unclear if or how unmet learning objectives from specific courses are dealt with in the curriculum.

Educational and Student Learning outcomes for the PhD and MS seem appropriate as well, but the metrics used may need further refinement. For example, assessing the graduates’ ability to effectively communicate technical information may not be correctly assessed by the ability of the graduate to find a job. I would encourage the department to identify other/additional metrics, perhaps by utilizing other examples of technical communication (such as conference presentations, poster presentations, journal article manuscripts, other research presentations, etc.) that could be captured and assessed by advisors as a part of the overall department evaluation of the student learning outcomes.

III. Faculty Productivity

Please evaluate the following

Qualifications

_X_ Excellent __ Very Good __Appropriate __Needs Improvement __N/A

Publications

_X_ Excellent __ Very Good __Appropriate __Needs Improvement __N/A

Teaching Load

__ Excellent __ Very Good _X_Appropriate __Needs Improvement __N/A
External Grants
_ X_ Excellent  ___ Very Good  ___ Appropriate  ___ Needs Improvement  ___ N/A

Teaching Evaluations
___ Excellent  _ X_ Very Good  ___ Appropriate  ___ Needs Improvement  ___ N/A

Professional Service
___ Excellent  ___ Very Good  _ X_ Appropriate  ___ Needs Improvement  ___ N/A

Community Service
___ Excellent  ___ Very Good  _ X_ Appropriate  ___ Needs Improvement  ___ N/A

Please elaborate if you have identified any items in this section as Excellent.
The faculty, all but 2 to 3 members, have excellent funding and publication records. These individuals publish approximately 4 peer-reviewed papers per year and support approximately 5 graduate students at the rate of $27,500 per year as well as several post-doctoral fellows. The amount of funding obtained ($220,000 per individual prorated) from federally competitive programs (e.g., National Science Foundation and NIH) by these individuals is admirable. The quality of the faculty members is outstanding, many have obtained CAREER awards. Furthermore, the recruitment of an NAE member to the department that is devoted to mentoring graduate students is outstanding.

Please elaborate if you identified any items in this section as Needs Improvement. Provide recommendations in the area of Faculty Productivity.
Click here to enter text.

Other comments (optional)
The faculty as a whole are well qualified and very active in professional service. The faculty do an outstanding job at securing funding for their research, which have service focused components, especially in view of the current rankings, department history and facilities. The department trajectory in the area of funded research is extremely promising and the faculty should be rewarded for their efforts. Their scholarly contributions are impressive.

IV. Students and Graduates
Please evaluate the following
<table>
<thead>
<tr>
<th>Category</th>
<th>__ Excellent __</th>
<th>__ Very Good __</th>
<th>__ Appropriate __</th>
<th>__ Needs Improvement __</th>
<th>__ N/A __</th>
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<td>Retention</td>
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<td>Demographics</td>
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<td>Job Placement</td>
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<td>Student/ Faculty Ratio</td>
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Please elaborate if you have identified any items in this section as Excellent.

Click here to enter text.
Please elaborate if you identified any items in this section as Needs Improvement. Provide recommendations in the area of Students and Graduates.

Other comments (optional)
In general, the student metrics are typical of peer institutions. Graduation rates, time to degree, retention and enrollment are generally appropriate for the number of faculty. The job placement of graduates is very good and it is clear that the faculty are actively helpful in placing their students. Job placement is very important to the visibility of the department and building "name brand" recognition in industry, academics and at large.

The department needs to ensure that policies, academic requirements, and timing of degree milestones are clearly communicated to all students in the program. Current policy seems to be addressing this issue.

The Department should consider giving some credit for courses completed at other institutions on a case by case basis. In addition, they should consider accepting some M.S. students to increase class enrollments and the possibility of granting M.S. degrees to their Ph.D. students to increase the number of M.S. degrees awarded.

V. Facilities and Resources

Please evaluate the following:

Facilities
__ Excellent  __ Very Good  __ Appropriate  __ X_ Needs Improvement  __ N/A

Facility Support Resources
__ Excellent  __ Very Good  __ Appropriate  __ X_ Needs Improvement  __ N/A

Financial Resources
__ Excellent  __ Very Good  __ Appropriate  __ X_ Needs Improvement  __ N/A

Staff Resources
Please elaborate if you have identified any items in this section as Excellent.

Click here to enter text.

Please elaborate if you identified any items in this section as Needs Improvement. Provide recommendations in the area of Facilities and Resources.

This Department is leading the University in funded research productivity (e.g., funding, publications, Ph.D. degrees). The department productivity is even more impressive when taking into consideration the relatively low level of support as outlined below. An investment of resources in this department should have significant benefits to the University. In addition, it would help to retain the high quality of faculty members the department currently has and who will be pursued by outside programs. Providing the department with an appropriate support level will help to retain these talented individuals.

Staff Resources – In terms of staff resources, the two full time staff members in the department received excellent reviews. However, the number of staff members seems quite low. One staff member is responsible for the entire payroll and $4.3 M worth of contracts and grants. In addition, this individual helps new faculty learn the financial system of the university. The other one takes care of everything else. Travel reimbursement is backlogged (3 months or so); graduate students order all supplies and are responsible for procurement. This is challenging for faculty that work in the area of biological engineering and may become more challenging as regulations regarding purchasing of chemicals and chemical inventory are put into place. Faculty are responsible for many things that staff traditionally would do and this is not sustainable. As the department grows, the faculty should have greater support and this may help with faculty retention, which is of paramount concern to the department chair and the dean. It is apparent that the two staff persons available to the department are operating at capacity. With the anticipated new hires and additional graduate students expected to enter the department, current staffing will be insufficient. Personnel should be added to assist with technical maintenance of lab equipment, procurement of lab supplies, and administrative tasks (i.e., copying, processing travel reimbursements, coordinating recruiting efforts, etc.).

Facility Support Resources – In terms of facilities/equipment support, the department would benefit from some technical assistance. They currently do not have a technician in the department to help maintain research and instructional lab equipment and potentially train new students. The response time for repairs for leaks or hoods was mentioned as being long, and could be improved, but other matters were more pressing for the department. These may individually seem like small problems, but they are important in the larger scope and in setting the tone of excellence. Lab spaces need to be properly and promptly maintained for safety and industrial hygiene.

Facilities – Although the quantity of laboratory space on a square footage basis is adequate for the existing (13) faculty members, it will be insufficient for the 4 new approved hires (starting Fall) and 3
additional planned hires. In addition, the quality of much of the lab space needs to be improved. The remodeled laboratories on the 2nd floor of Livermore are great, but the basement laboratories and annex laboratory are not of high quality and would not be valuable for recruiting new faculty. The faculty also do not have contiguous space. This can be a safety issue in certain circumstances (e.g., transporting materials among labs), affect the productivity of faculty and graduate students that spend time “commuting” between buildings, and decrease the camaraderie of the graduate students as they are spread out through various buildings and do not have a graduate lounge or area. Any additional space should be of sufficient quality for the department to continue their upward research trajectory. The department needs higher quality space to attract the best new faculty candidates possible and to assist in the retention of existing faculty. It is also recommended that allocated research lab space be located in close proximity to the main (core) department spaces.

Financial Resources- the department has done well in managing finances in these difficult economic times. The resources should be improved to meet the needs outlined above and to maintain the significant ongoing efforts.

*Other comments (optional)*

**VI. Overall Ranking**

*Overall Ranking*

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<th>X</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Appropriate</th>
<th>Needs Improvement</th>
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*Please provide summative conclusions based on the overall review.*

The Chemical Engineering Department at TTU is clearly greater than the sum of its parts. The faculty should be rewarded for doing all of the right things. The people in the department appear passionate, motivated, and eager to improve their program. The department is doing an outstanding job in view of the resources available and appears to be a cohesive body that recognizes their own considerable forward momentum and potential. My impression is that the department is better in quality than their current ranking numbers alone would indicate.

The department has self-identified three key challenges that must be addressed in order to continue in their advancement and upward trajectory. The department has put considerable effort into program improvements to date and has made considerable advances. I agree with the department in their assessment of the nature and importance of these challenges moving forward.

Key challenge #1 – retaining successful faculty

Comment [CK1]: Should “I” instead be “We”?
The issue of faculty retention is complex and multi-faceted. There is no clear single solution to address this issue. It appears that faculty retention will continue to be an issue as TTU continues to improve.

Key challenge #2 – research lab space
The quantity and quality of research lab space is a key issue and is perhaps also related to faculty retention.

Key challenge #3 – staffing
The available staffing is “borderline adequate” for the amount of research and instruction done by the department. Additional hires and/or increased research efforts will require additional staff support.

Please provide summative recommendations based on the overall review.
The chemical engineering department has a demonstrated record of recent improvement. It is appreciated that their improvement comes as a result of efforts across the University, meaning that all interested parties (i.e., graduate students, staff, faculty, the Dean’s office, upper administration and others) have contributed to the success of the chemical engineering program and all parties benefit from the improvement. The department will need additional resources from the administration to continue their improvement.

- The Department needs to be given greater resources in all areas in order to maintain their current level of productivity and retain their faculty and to allow them to continue to increase their productivity.
- New hires will require additional space. Attracting the best candidates will be easier if the lab spaces available are high quality and renovated and available at the time of interview/campus visit.
- Another recommendation is to provide additional staffing to the department. Additional staffing will help to reduce the administrative load on research active faculty and allow them to have additional time to put their unique and creative talents to use in growing the research programs and providing better educational experiences to students. Additional staffing may also help with faculty retention.
- Developing a graduate seminar program where the graduate students give presentations to help break down the silos between research groups
- Developing a plan to ensure the success of graduate students that enter without a chemical engineering Bachelors degree.