Graduate Program Review – Response Form
Texas Tech University

Program Reviewed: Petroleum Engineering

Onsite Review Dates: March 1-2, 2016

Name of Reviewers:

Internal: (Please include Name, Title and Department)

External: (Please include Name, Title, Department, and Institution)

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I. Academic Unit Description and Strategic Plan

Please evaluate the following departmental factors by clicking and selecting the appropriate rating descriptor:

Vision, Mission and Goals: Very Good

Strategic Plan: Good

Please comment on the positive components and suggested areas of improvement.

Strategic planning for petroleum engineering departments (especially at the current time) is a challenge: the industry cycles are unpredictable and the corresponding changes to academic departments (mainly faculty size and student enrollments) respond on a slower timescale. The TTU strategic plan is as relevant as one can expect given the current situation.

The Department's vision, mission, and goals for the graduate program are centered around increasing PhD's in the program, as a response to the need for academics, industry demand for research, and the need for TA support.

This raises the question about whether this demand will remain high (given industry downsizing and incoming enrollments decreasing in the US), and therefore whether this will remain as strong a driver as it seemed to be a few years ago.

The top bullet listed under goals is to bring TTU into the top four ranked departments. This is certainly a laudable goal but I question if it is not a better approach to set independent benchmarks to achieve excellence rather than a rank-based benchmark where performance is gauged (questionably) only relative to other departments' performance. If the right
independent benchmarks are set and met, I would argue that the improved rankings will follow naturally.

II. Program Curriculum

Please evaluate the following program curriculum factors for the masters and doctoral programs by clicking and selecting the appropriate rating descriptor:

Alignment of the program with stated program and institutional goals and purposes:
- Masters degree: Good
- Doctoral degree: Good

Curriculum development coordination and delivery:
- Masters degree: Very Good
- Doctoral degree: Good

Program learning outcomes assessment:
- Masters degree:
- Doctoral degree:

Program curriculum compared to peer programs:
- Masters degree: Excellent
- Doctoral degree: Very Good

Please comment on the positive components and suggested areas of improvement.

Alignment of the program with stated goals: The department appears to well supported institutionally for the hiring of additional faculty in coming years. The goal of focusing on key areas of excellence might be enhanced by its locale (west Texas oil and gas operations), which have unique needs and should remain strong well into the future. The main challenge in increasing research and ranking will come from the faculty demographics, which are bimodal (i.e., a senior group and a new group). This problem is compounded by the low teaching loads given to the junior faculty, which put excessive teaching burden on senior faculty and reduce their ability to perform mentoring or pursue large research opportunities. The Department chair indicated that upcoming hiring will target mid-career or experienced faculty, which should help address this problem.

The graduate curriculum is sufficiently broad and is well planned. It was not clear whether there is room (or faculty capacity) for special topics courses that might help promote research in key areas.

The team did not receive specific information on outcomes assessment.
III. Faculty Productivity
Please evaluate the following faculty productivity factors by clicking and selecting the appropriate rating descriptor:

   Qualifications: Excellent
   Publications/Creative Works: Good
   Teaching Load: Needs Improvement
   External Grants: Needs Improvement
   Teaching Evaluations:
   Professional Service: Very Good
   Community Service: Very Good

Please comment on the positive components and suggested areas of improvement.

Qualifications of the faculty are strong.

Publications are adequate (currently low in peer-reviewed journals but more significant in conference publications). There will need to be significant improvement to elevate the department to top-four ranking, and this is acknowledged by the leadership and the faculty.

The teaching load represents a serious problem. The junior faculty have a restricted load, which is apparently mandated by the college of engineering. For the case of the assistant professors in petroleum engineering, this actual load (contact hours per week) appeared to be unreasonably low relative to peer institutions and given the large number of undergraduates in the program. The consequence of this is an unreasonably high teaching load on some or all of the senior faculty.

External proposals and funding is low, which is a problem that was articulated by the department and college administration. A plan has been put forth by the college and department administrators to help improve in this area.

Teaching evaluations were not examined. Anecdotal evidence (interviews with students) did not suggest that there are any problems in this area.

Faculty professional and community engagement appears appropriate.

IV. Students and Graduates
Please evaluate the following student- and graduate-related factors by clicking and selecting the appropriate rating descriptor:

   Time to degree:
       Masters degree: Excellent
       Doctoral degree: Excellent
Retention:
- Masters degree: 
- Doctoral degree: 

Graduate Rates:
- Masters degree: 
- Doctoral degree: 

Enrollment:
- Masters degree: Very Good 
- Doctoral degree: Very Good 

Demographics:
- Masters degree: Good 
- Doctoral degree: Good 

Number of Degrees Conferred Annually:
- Masters degree: Very Good 
- Doctoral degree: Very Good 

Support Services:
- Masters degree: Good 
- Doctoral degree: Good 

Job Placement:
- Masters degree: Excellent 
- Doctoral degree: Excellent 

Student/Faculty Ratio:
- Masters degree: Very Good 
- Doctoral degree: Very Good 

Please comment on the positive components and suggested areas of improvement.

Time to graduation is appropriate.

Retention and graduation rates are not defined or quantified in the report. It should be noted that the applicant-to-admit ratio is large, which is a strength of the program (i.e., indicating the ability to be selective).

Ethnicity data were not available, as the majority of applicants and enrolled students fell into the generic category "non-resident alien". One area in need of improvement is to increase the number of U.S. students in the PhD program. This has been a challenge in all petroleum engineering departments in recent years due to the strong employment of BS graduates. TTU appears to be actively working to improve in this area.
The number of degrees conferred annually has increased dramatically in the past couple of years, pulling the program out of its status as a low-producing degree program. Enrollment trends suggest that the number of degrees will remain comparable in coming years.

Support services are adequate. There was some concern by the review committee about whether new students are getting consistent advising and guidance. This is not a criticism of the work being done by the graduate advisor but rather a result of his being stretched too thin due to the rapid growth in graduate enrollment, as well as the possible need for some improve department-level policies and procedures for graduate students.

Job placement has been very effective over the past five years.

Student-faculty ratio is at an appropriate level for the graduate program. (It is too high in the undergraduate program, which of course has a negative effect on both programs.)

V. Facilities and Resources
Please evaluate the following facilities and resources factors by clicking and selecting the appropriate rating descriptor:

- **Facilities**: Excellent
- **Facility Support Resources**: Good
- **Financial Resources**: Very Good
- **Staff Resources**: Very Good

Please comment on the positive components and suggested areas of improvement.

The Department is in a new building with excellent laboratory space. It will likely end up crowded/insufficient if the department reaches its target size of faculty and graduate students.

The committee was told that fabrication/assembly of equipment in the undergraduate visualization lab was outsourced to technicians from a different university. It is not clear whether this is an indication of inadequate technical support within the department, or simply that this was a specialized job an no one internally had the time and/or particular expertise.

A large fraction of graduate students are funded on TA support, and the most recent assistant professor hire(s) received large start-up packages. Hence, institutional financial support appears to be strong. The PhD level funding model should evolve so that there is a more balanced distribution of RA vs TA funding.

VI. Overall Ranking
Please provide an overall rating of the masters and doctoral degree programs by clicking and selecting the appropriate rating descriptor:

- **Overall Rating**:
  - Masters degree: Very Good
  - Doctoral degree: Good
Please provide summative conclusions based on the overall review.

The Department of Petroleum Engineering is still in a transition from a teaching-focused program to a research-active department. Like many other U.S. petroleum engineering departments in 2016, it has been severely challenged by the dramatic increase in undergraduate student enrollment (combined with the inability to respond as quickly with increases in faculty size). Although caused at the undergraduate level, this impacts all aspects of department operations.

Resources (including faculty, administration, and university-level support) are being invested and showing signs of a positive trajectory toward strength in research and the graduate program. The University must remain aware that despite good planning and resources, progress toward this goal may have some setbacks due to the turbulence in the oil-and-gas industry. (The past five years in particular have seen a period of high oil prices which led to very large UG enrollments which is now being followed by low oil prices with limited employment for graduates and limited opportunities for external research funding.)

The University is providing appropriate support of the program through TA funding and new faculty lines. The challenge of high undergraduate enrollment will take another two years to reach appropriate levels.

The current faculty numbers and demographics (somewhat a bimodal distribution) are having a significant impact on two specific areas that came up repeatedly during the team’s visit. First, the teaching load: the senior faculty are assigned unusually large loads in most cases, while at the same time the junior faculty are assigned what appear to be unreasonable light loads in most cases (especially in comparison to their research productivity). Second: graduate student advising. The graduate student population seems to have a collective sense that there are only one or two faculty with whom most graduate students would like to do research. It seems to be affecting morale and thus needs to evolve to a more balanced situation (or the student perception corrected if it is not an actual issue).

Currently, the level of proposal submissions, funded research, and publications are not commensurate with where the Department wants to be. The department leadership is aware of this and has put measures into place to improve. Leadership by senior faculty members will be crucial to ensure that a research culture develops in the department.

Please provide summative recommendations based on the overall review.

1. The department should hire at least three more faculty members, while at the same time balancing the faculty demographics in the department and creating a more equitable distribution of teaching loads.
2. It is essential that the department identify senior faculty that can mentor new junior faculty. This will include ensuring that senior faculty have the time for this mentoring to occur. To be specific, reduce the teaching obligations of those senior faculty who have the potential to contribute to research and graduate studies.
3. The Department has been able to get away without active graduate recruiting in recent years due to the demand for global demand for degrees in petroleum engineering. However,
graduate recruiting should become more proactive, particularly to increase the number/quality of US students.

4. While aiming to improve as an internationally recognized program, the Department should not lose sight of opportunities associated with its proximity to the Permian Basin: target research areas that are important and/or unique to this area.

5. Collectively, graduate students seem unclear on the sequence/requirements for graduation. I recommend that the department clearly communicate to graduate students a defined path for completion of their degree, including advising as they enter the program, selection of a research advisor, exam requirements/sequence, and final requirements for graduation.

6. Many but not all qualified graduate students are able to obtain teaching assistantships and there seems to be some resentment among those that were not awarded TAs. While some hard feelings are inevitable, the department may want to formalize the selection process to ensure graduate students are aware of the process/requirements to be considered.