External Review of the Graduate Program

Department of Petroleum Engineering

Texas Tech University

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Review Team

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Background

The review team was asked to evaluate the graduate program in the Texas Tech University, Department of Petroleum Engineering in the Fall of 2009. Self evaluation departmental documentation was not complete until April, 2010. The review committee gathered materials, not yet complete, and met with the Department Chair, faculty and graduate students on May 5th, 2010. During that session, discussions were held with the Department Chair, all available faculty, individual faculty, a group of graduate students and individual graduate students. A facility tour was conducted of on-campus laboratories, classrooms, offices and support areas. A closing session was held with the Department Chair where additional documentation was requested.

Following that in-person assessment and receipt of additional documentation, the committee prepared its report. The External Reviewer sent his assessment of the PhD program. The on-campus review committee members were asked to review the entire graduate program (MS and PhD programs).

Throughout this report, the individual review criteria are rated on a scale of: excellent / very good / good / satisfactory / unsatisfactory.
Overall quality and Direction of the Graduate Program

Rating: In Transition; Satisfactory

The focus of the Department of Petroleum Engineering (DPE) is on undergraduate education. Several people told us that there is high demand for students with a BS in PE and that attending graduate school does not increase a person's salary or value in the Petroleum Industry. This driving force makes it difficult to attract and keep faculty and graduate students. A graduating senior is faced with either going to industry for a high salary or attending graduate school and, after more years of study, getting a job at a similar salary as if they had not attended graduate school.

The DPE is in a state of transition. The current Department Chair, Dr. Lloyd Heinze, has submitted his resignation effective August 31, 2010. The DPE has a disproportionate number of junior faculty. The Department Chair is a full Professor. One Associate Professor (Dr. W. House) came from industry and was not promoted. Currently, the DPE has 1 Instructor, 2 Assistant Professor, 2 Associate Professor (one of which was recently denied tenure), and 1 Professor (N=6 faculty; p 15 of DPE self study). Two faculty positions are open and remain unfilled. This leaves the DPE at a cross-road in its development. In addition, the Dean of the Edward E. Whitacre, Jr. College of Engineering (Dr. Jon C Strauss) has announced his resignation and a search is well underway for a new Dean of Engineering. It would be difficult, at the moment, for the DPE to have a clear vision of its future with a change of leadership and a relatively young faculty.

In spite of its precarious position at this moment in time, the faculty are enthusiastic about their research and graduate program. They have a large number of graduate students in total and per faculty. Most students are supported by donated rather than competitive funding.

The DPE has a considerable endowment. It has increased from $5 to $24 million over the past 5 years. External funding has increased from $0.2 to $46 million over the last 5 years. In the last 6 years, the DPE faculty have written 35 proposals, none of which were funded (p 35 of the DPE self study). Research expenditures totaled $319,255 over the last 6 years or $53,209 on average per year (p. 39 of DPE self study). Peer institution DPEs reported annual research expenditures of $424,000 to $790,000 per year for the same period. Consequently, while the endowment is quite large, research expenditures are low. Internal research funding is available ($102,300 to $303,000 per year in the last three years; p 40 of DPE self study) for faculty and graduate student research.

The DPE seems focused on undergraduate education. They do not have a good balance of senior and junior faculty. They do not have a good program of mentoring young faculty. The heavy undergraduate teaching load, the available internal support, and the nature of the DPE (being industrial and not a basic science area) contribute to the low level of external support. Still, other institutions are more successful at garnering external research support. A reforming of research activity would allow the DPE to increase external research support while maintaining a strong undergraduate education program.
New faculty ought to be hired at the senior and mid-career levels who have successful external funding records and who can contribute to development of a new vision for the DPE. In addition, the new Dean of the Edward E. Whitacre, Jr. College of Engineering ought to recruit and mentor the new chair of DPE as the department establishes its new vision for the future.

Faculty Quality and Productivity

Rating: Satisfactory to Good

The Bob L. Herd Department of Petroleum Engineering (DPE) is staffed with industry-experienced faculty members who have an average of more than 20 years of experience per faculty member. The current strength of the faculty is six (1 instructor, 2 Assistant Professors, 2 Associate Professors and 1 Professor). The department has a disproportionate number of junior faculty. The DPE is currently recruiting two faculty members to fill the open slots. It appears that the starting salaries of the faculty members are much lower than the salaries offered by the industry. The DPE has increased the starting salaries by $10K during fall 2008 to recruit new faculty members. The starting salaries and the start-up packages are very crucial to recruit the faculty members specialized in petroleum engineering.

Although the current teaching loads and the student/faculty ratio are high, the faculty members are working very persistently in developing scholarly publications and submitting the proposals for external funding. The untenured faculty members are working very diligently in balancing to teach a large number of undergraduate/graduate courses and scholarly activities. The funding opportunities from state and federal agencies for research in the petroleum engineering are very limited. Hence the faculty members at DPE are soliciting funding from industrial sources. In order to be successful in getting funding from industry it is very important to develop an industrial consortium in a focused research area. The development of a consortium requires senior faculty members with track record in a focused research area.

In general the attitude of faculty members is very good and positive. In order to improve the research productivity of faculty members, it is recommended that senior faculty be hired with a track record for the development of focused, externally-funded research programs. Current faculty should be provided release time and graduate student support to pursue grant writing and scholarly activities.

Quality and Quantity of Graduate Students

Rating: Good

The Bob L. Herd Department of Petroleum Engineering (DPE) offers Graduate Certificate Program, Masters Degree with Thesis and without thesis, and Ph.D. degree program. The DPE also has combined BS-MS degree programs.
The Program Review Committee had an opportunity to visit with some of the graduate students. In general the attitude of the students is very positive and they realize the higher student/faculty ratio in the department. The graduate students also expressed satisfaction regarding the improvement in research atmosphere in the department.

During the academic year the DPE has 15 MS and 14 PhD students in the graduate program. Due to high demand from industry for recruiting students with BS degrees, the students expressed that it is a very difficult decision to stay for graduate school.

The graduate certificate program along with the leveling courses is facilitating recruitment of students from other engineering programs for pursuing graduate work in petroleum engineering.

Some faculty members expressed the view that the quality of the graduate students is improving due to renewed emphasis on research and scholarly publications. The students are also provided opportunities to participate in the professional meetings.

One of the major issues is with the financial support for graduate students. Since many faculty members do not have external funding for research and graduate student support, the department is using internal money to support the graduate students. The PhD program is relatively young and needs more financial resources for recruiting and supporting doctoral students.

The quantity of the graduate students is appropriate to the size of the faculty in the department.

Curriculum and Programs of Study

Rating: Satisfactory

The Department offers the MS degree, with thesis and without thesis, the PhD degree, as well as a Graduate Certificate in Petroleum Engineering. The Graduate Certificate includes 15 hours of “leveling classes”, each of which (PETR 5380-5384) is cross-listed with the equivalent undergraduate class. The other required class for the certificate, PETR 5300, is not listed in the catalogue. These leveling classes can apparently also be used for fulfill up to 15 hours of the 33 hours required for the MS for students who do have a BS in petroleum engineering, as well as for the PhD degree. Syllabi of most leveling classes do not have any clear indication of the extra work required to obtain graduate credit. An instructor who is not a member of the Graduate Faculty teaches one course, PETR 5382. Enrollment in the leveling classes comprises a substantial part of the total graduate hours in the Department, probably because many students in the graduate programs lack an undergraduate degree in petroleum engineering.

MS students are required to take one course from each of five areas. PhD students must complete two courses from each area. Four to seven courses are listed for each area. No syllabi were provided for any of these courses. Of the 28 courses, only 8 were taught 3 or more
times over the last 6 years, 8 were taught twice, and 9 were taught only once. No pattern in these course offerings is obvious. Better organization and management of these graduate course offerings would provide greater predictability for both students and faculty. The long list of courses in the catalogue, most of which are rarely taught, could be extremely misleading to potential applicants to the graduate programs in the Department. The high enrollments in PETR 5000 (Studies in Advanced Petroleum Engineering Topics) suggest that this course is being used to its limit for both the MS and PhD degrees.

Facilities and Resources

Rating: Satisfactory

The Departmental office is spacious and appears to be well staffed. The adjoining conference rooms provide large areas for meetings, student job interviews, and related functions. Classroom space is adequate for the graduate program. Regular faculty offices are small and clustered in joint suites that restrict graduate student-faculty interaction, as well as lacking space for modern desk-top computing systems used for advanced modeling. Large areas are available for teaching and research laboratories, but most contain little modern equipment for teaching or graduate research. The tour of the Department gave the impression of a long period of research inactivity in the Department and little investment of Departmental, College or University resources for research infrastructure. Recent improvements in instrumentation by the newer faculty are obvious and, according to the graduate students, are helping the research environment. However, it appears that each faculty member is working on their own, and that there is little cooperate/collective investment in enhancing research facilities within the Department overall.