

# Coping with cycles in educational enrolment



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In 1928-29 the Board of Regents approved plans to establish a course in petroleum production engineering at Texas A&M University, the first in the State of Texas. Petroleum Engineering courses were offered for the first time in 1929. In 1949, Dr Harvey T. Kennedy spearheaded the development of a graduate programme in petroleum engineering. The first MS degree was conferred in 1951 and the first PhD was conferred in 1953. Since the start of the programme, the Texas A&M petroleum engineering department has granted more than 6,400 degrees. Degree programmes in the petroleum engineering major include the undergraduate degree of BS (Bachelor of Science), and the graduate degrees of MEng (Master of Engineering), MS, (Master of Science), and PhD (Doctor of Philosophy). Our mission is to create, preserve, integrate, transfer and apply petroleum engineering knowledge and to enhance the human capability of its practitioners.

The undergraduate curriculum in petroleum engineering is structured into four academic years. The goal of the curriculum is to provide a modern engineering education with proper balance between fundamentals and practice, and to graduate engineers capable of being productive contributors immediately but also prepared for life-long learning. The curriculum is comprised of four major components:

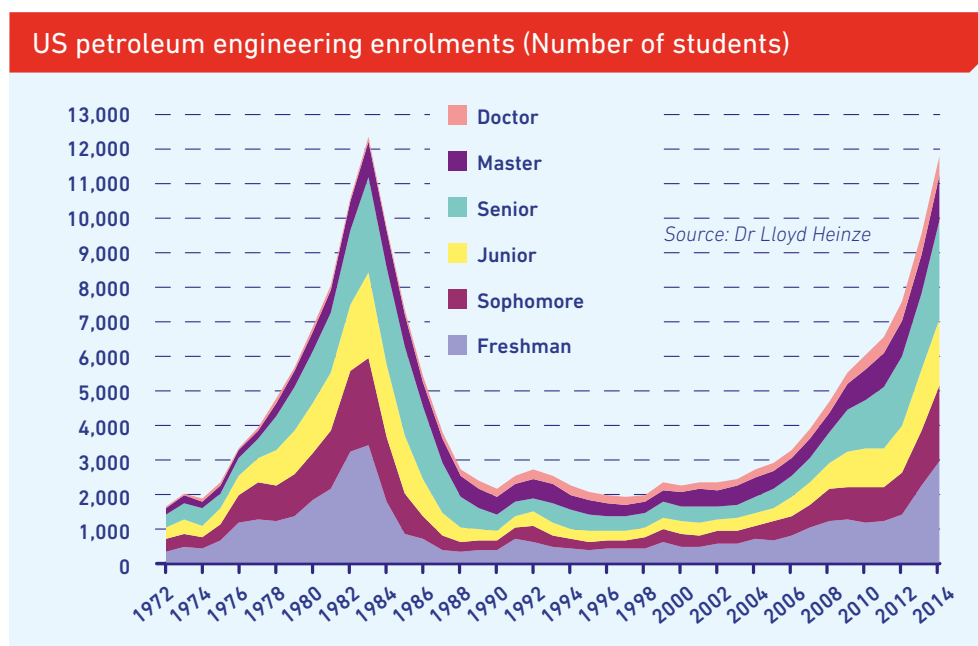
1. Fundamental math, science, and communication;
2. Engineering science;
3. Petroleum engineering science and technology;
4. Petroleum engineering design.

The first two years of the curriculum are devoted primarily to the first two components. Petroleum engineering science and technology instruction occurs mainly in the final two years. Finally, the students are given design experiences incorporated in courses throughout the curriculum, and culminating in a capstone design course in the final semester.

All undergraduates in the programme are provided with unique opportunities for interaction with industry. Before progressing into the fourth-year courses of the curriculum, students are required to complete at least one six week employment experience. Most students are able to and choose to participate in more than one employment period during their undergraduate study. In the US petroleum industry, summer internships for undergraduate students are prevalent, and in fact, for many companies are the primary tools for evaluating students for full time employment. Students are also required to participate during each of the last two years of the curriculum in the department annual student paper contest, in which they present the results of an independent study to a panel of industry engineers. More

than 100 professionals from industry volunteered to serve in judging technical presentations in the 2014 contest, making significant contributions to the development of critical professional communications skills in our graduates.

Another significant interaction between industry and the undergraduates occurs in the capstone design course in the final semester. In this course, students use field data provided by





industry sponsors, and present their final project results to panels of industry experts.

Dramatic changes in enrolments have always challenged petroleum engineering programmes in the United States to adjust to periods of rapidly increasing, or rapidly decreasing enrolments. The chart shows historical enrolment data in the US since 1972. The job market for petroleum engineers changes dramatically in response to prevailing world oil and gas prices, and the number of students seeking petroleum engineering education responds rapidly to changes in perceived demand.

### Flexible faculty numbers

To maintain a high quality educational programme, a petroleum engineering department needs to be able to add faculty when enrolments are increasing, but also be able to potentially reduce numbers if a dramatic decrease in enrolment occurs. At Texas A&M, we are achieving this balance by gradually growing our tenured/tenure-track faculty during the past ten years of enrolment growth, while also adding significant numbers of non-tenured professors of engineering practice. These professors of practice are petroleum engineers with 25+ years of industry experience who share their experience with our students. We currently have 23 tenured/tenure track assistant, associate, and full professors, and 13 lecturers and professors of engineering practice.

The graduate programme is a major part of the petroleum engineering educational enterprise, having grown rapidly for the past ten years at Texas A&M University. There are currently about 110 PhD, 150 MS, and 160 MEng students in our department, with almost all of the MEng students being distance learning students. About one third of all Texas A&M Petroleum Engineering degrees conferred over the past 15 years have been graduate degrees.

The curriculum for graduate students is much less structured than that for undergraduates. MS students take eight graduate courses, with the courses selected in consultation with their research supervisor and are chosen based on the student's background and the thesis topic. All MS students conduct research and write a thesis. PhD students typically take an additional eight to ten graduate level courses, with the selection guided primarily based on their dissertation topic.

The Texas A&M petroleum engineering department offers a large, broad graduate curriculum, with over 30 different graduate courses on each year. These courses cover the entire spectrum of petroleum engineering activities.

A rapidly growing part of our graduate programme is the Master's of Engineering obtained through distance learning. Graduate courses being taught on the College Station campus are videotaped and streamed on the internet to students who can reside anywhere with internet access. Most of these students are practicing engineers with full-time jobs who take one or two courses per semester. Distance learning MEng students take 11 courses and write a Master's report, which is usually based on work they are doing as part of their job. Interactions with the course instructor and teaching assistants occur through the course website. More than 160 students are currently participating in this programme with 20 to 30 graduating per year.

The heart of graduate instruction is the individual supervision of graduate research by a faculty member. Thus, the graduate educational experience is an integral part of the department's research programme. With external research funding of about US\$9 million a year, the department is able to provide research assistantships to a large majority of the MS and PhD students. Other students have their own funding provided by a company or government. Because about 70 per cent of the research funding is from industry, most of the graduate students have extensive interaction with industry through review meetings and other contacts. The research done by the graduate students with their professors results in publication of numerous technical papers. In 2012, the faculty and graduate students presented 89 conference papers and published 59 refereed journal papers.

The Texas A&M petroleum engineering graduate population is very international in nature. Currently, students from 48 different countries are enrolled in the graduate programme. The Texas A&M University petroleum engineering programme has benefited the petroleum engineering profession throughout the world. Our graduates are also educating the next generation of petroleum engineers in many locations around the world. ■

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