Master of Science (MS) in Chemical Engineering (ChemE)
Master of Science (MS) in Petroleum Engineering (PE)
Doctor of Philosophy (PhD) in Chemical Petroleum Engineering (CPE)

Department Highlights
Highlights of the graduate programs in Chemical and Petroleum Engineering include:

- the wide influence of chemical and petroleum engineers ranges from fuels, oil and gas exploration/production, refining, chemicals, transportation, alternative energy, advanced materials, biomedical devices, tissue engineering, water treatment, biotechnology, drug design and delivery;
- research and teaching in CPE addresses many of the economic needs of both the State and the nation;
- CPE collaborates with major US and international energy companies such as Conoco-Phillips, ExxonMobile and Shell, and students have a history of successful careers, in consulting, process/product-related research and management in these and other major companies;
- CPE has particularly strong teaching and research ties to the Middle East, Europe, India and China, which provide an opportunity to recruit high quality graduate students from these countries; these ties include exchange programs with the University of Stuttgart, Germany, the Swiss Federal Institute of Technology (ETH), Switzerland, and Petroleum University of Teheran, the University of Swansea, UK, and the Technical University of Lodz, Poland;
- Faculty have given invited lectures, presented papers or given short courses in Australia, Norway, Iran, Switzerland, United Kingdom, France, Germany, Poland, Australia, New Zealand, Venezuela, Portugal, Italy and India;
- demand for CPE graduates has been consistently high over the last five years;
- CPE graduates have high starting salaries (the highest of all engineering graduates with the exception of petroleum) and job placement rate: over ninety percent of graduates are either in jobs or in graduate programs within six months of graduation;
- average enrollment in the MS program in ChemE and PhD program in CPE during the last five years have remained steady;
- maintenance of a strong Petroleum industry focus through the Tertiary Oil Recovery Project (TORP), Faculty expertise in enhanced oil recovery techniques and reservoir engineering research, and the Center for environmentally Beneficial Catalysis, where Faculty collaborate with industry to research catalysis and reaction engineering;
- significant Faculty expertise in electrochemical engineering, in advanced computational techniques, electronic materials, and biomedical engineering;
- one Faculty member who is a member of the National Academy of Engineering;
- Faculty recognition for their professional achievements through awards from the Society of Petroleum Engineers and the American Society of Engineering Education, Institution of Chemical Engineers, London, endowed professorships in the School of Engineering, and School and/or University-wide teaching awards, research awards, and service awards;
- two major research centers, the Center for Environmentally Beneficial Catalysis and Tertiary Oil Recovery Project, which are funded at $30M and $1M, respectively;
- archival journal publications per Faculty member increased from 2.3 in 2005 to 7.1 in 2009;
- total expenditures increased from $1.24M in 2004, to $2.74M in 2008, expenditures per
FTE Faculty members increased from $82.7K in 2004 to $144.2K in 2008, and the number of research projects increased from 21 in 2004 to 37 in 2008;
• receipt of departmental award for teaching excellence from the University of Kansas Center for Teaching in 2004;
• one Faculty member’s appointment as a CTE teaching Fellow in 2008;
• student credit hour production per Faculty member for the department increased from 134.9 in 2004/5, to 279.6 for 2009/10;
• an improvement of student satisfaction due to changes made in 2006 and 2007.
1. What do we do and why do we do it?

1A. Mission of Unit
The primary mission is to develop engineering graduates of the highest international caliber with an ability to design, operate and manage processes and to provide leadership in academia, the process industries and their constituent organizations in the USA and worldwide. The application of the highest international standards of education and training is essential given the rigorous health, safety, and environmental requirements of our employer industries, and the high value of the capital assets used by those industries. A second part of our mission is to foster, promote and resource research of the highest scientific quality, set in a context of medium or long term application in the chemical and petroleum industries and related disciplines, and to provide a stimulating and innovative environment for those to be trained in research methods.

1B. Unit Goals and Priorities
The principal objective of our program is to prepare graduates for professional practice in industry or government, and for doctoral training in chemical engineering, and other related disciplines.

1C. Short Mission Statement
The overall program mission for the department of Chemical and Petroleum Engineering is to provide a modern chemical or petroleum engineering education with proper balance between theory and practice.

1D. Role of Unit
The influence of chemical and petroleum engineers ranges into fuels, oil and gas exploration/production, refining, chemicals, transportation, alternative energy, advanced materials, biomedical devices, tissue engineering, water treatment, biotechnology, drug design and delivery. Consequently, chemical and petroleum engineering is an essential discipline of a high-quality School of Engineering. Understanding and dealing with advances in technology is critical for effective economic stability and growth in the State of Kansas. Opportunities must be available for students to receive a top quality education in Chemical and Petroleum Engineering to Bachelors, Masters, and PhD levels.

Research and teaching in our department addresses many of the economic needs of both the State and the nation. Kansas is an energy-producing state, heavily involved in petroleum and natural gas production, and in the processing of industrial chemicals, materials and agricultural chemicals. It is also an important national center for consulting engineering companies who employ significant numbers of chemical engineers at all levels. We collaborate with the Kansas Geological Survey, local oil producers, and the Kansas Oil and Gas Producers Association. We also collaborate with major US and international energy companies such as Conoco-Phillips, ExxonMobile and Shell. Petroleum Engineering is also an international field with all industrialized and developing nations dependent upon oil and gas as part of meeting energy demand. Given this broad responsibility that transcends Kansas, it is not surprising that our department's Faculty interact on an international level. We have particularly strong teaching and research ties to the Middle East, Europe, India and China, which provide an opportunity to recruit high
quality graduate students from these countries. We also have exchange programs with the University of Stuttgart, Germany, the Swiss Federal Institute of Technology (ETH), Switzerland, and Petroleum University of Teheran, the University of Swansea, UK, and the Technical University of Lodz, Poland. These programs foster the mutual exchange of students and ideas. During the last five years, our Faculty have given invited lectures, presented papers or given short courses in Australia, Norway, Iran, Switzerland, United Kingdom, France, Germany, Poland, Australia, New Zealand, Venezuela, Portugal, Italy and India. The participation of the Faculty is a measure of their international reputation in petroleum engineering.

Within the School of Engineering, the Chemical and Petroleum Engineering PhD degree shares the mathematics and fundamental sciences platform of all engineering disciplines. There are also many areas of common and complementary interests, for example, with Mechanical, Civil and Environmental engineering disciplines. Given the state, national and international significance of the chemical and petroleum engineering research, the PhD program is essential to the School and the University.

1E. Need and Impact Statements

Demand for Chemical and Petroleum Engineering graduates has been consistently high over the last five years. This is reflected in the high starting salaries (the highest of all engineering graduates with the exception of petroleum) and the high job placement rate: over ninety percent of graduates are either in jobs or in graduate programs within six months of graduation. The student demand continues to be strong. The average enrollment in the PhD program during the last five years has remained steady. Degree production has reflected the enrollments over the review period: 2005(1), 2006(1), 2007(4), 2008(2), 2009(7). PhD students in the program over the last five years have comprised a significant proportion of international students – 2005(83.9%), 2006(77.4%), 2007(77.8%), 2008(82.9%), 2009(79.4%). The average enrollment in the MS program in Chemical Engineering during the last five years has also remained steady. Degree production has reflected the enrollments over the review period: 2005(4), 2006(7), 2007(4), 2008(3), 2009(6). MS students in the program over the last five years have comprised a significant proportion of international students – 2005(50%), 2006(57.9%), 2007(61.1%), 2008(75%), 2009(58.8%). The average enrollment in the MS program in Petroleum Engineering during the last five years has fallen from nine in 2005 to four in 2009. MS Degree production in Petroleum Engineering has been variable over the review period. This is not expected to rise significantly in the near future, because our focus on graduate recruitment is at the PhD level in line with the School and department strategic plans. Students in the MS PE program over the last five years have been predominantly international students.

Our students have a history of successful careers, in consulting, process/product-related research and management in major companies, such as Conoco-Philips, Shell, ExxonMobil, DuPont, and Occidental Corporation.

2. Who does it? Faculty in Profile

2A. Quantitative Indicators

The Chemical and Petroleum Engineering department has a total of sixteen Faculty members. Thirteen of the Faculty members have PhD degrees from US institutions, and one each from Canada, India and United Kingdom universities. All are active in research, and supervise both undergraduate students and graduate students in research projects. All Faculty members regularly teach courses in the chemical engineering curriculum and four in the petroleum engineering curriculum. The research expertise of the Faculty covers the traditional areas of chemical engineering as well some non-traditional areas that have emerged in recent years. Through the Tertiary Oil Recovery Project (TORP), the Petroleum Engineering program has a strong industry focus. Four of the Faculty have expertise in enhanced oil recovery techniques and reservoir engineering research. Through the Center for environmentally Beneficial Catalysis, we also have expertise in catalysis and reaction engineering with a
strong industry focus. There is also significant expertise in electrochemical engineering, in advanced computational techniques, electronic materials, and biomedical engineering. Seven of the sixteen had industrial experience prior to joining the academia, and one had experience with professional engineering accreditation. One is a member of the National Academy of Engineering. We also employ one PhD-level instructor to assist with the core laboratory teaching. In addition, we employ instructors on an ad-hoc basis as required.

The Faculty’s commitment to both research and teaching has resulted in several honors and awards. Individual Faculty members have been recognized for their professional achievements through awards from the Society of Petroleum Engineers and the American Society of Engineering Education. One is a Fellow of the Institution of Chemical Engineers, London. There are thirteen endowed professorships in the School of Engineering, and three are held by members of CPE. Several of our Faculty members have received School and/or University-wide teaching awards, research awards, and service awards. Other professional activities of our Faculty include journal editorial board memberships, memberships on national committees, consulting, and chairs of international conferences.

CPE has two major research centers associated with the department. The Center for Environmentally Beneficial Catalysis is an engineering research center established in 2003 with funding of $17M from the National Science Foundation (NSF) and an additional $13M from the University and industry. The Director of the Center is a full member of our Faculty and many graduate students work on projects funded through the Center. A number of Faculty also are active members of the Center. The Tertiary Oil Recovery Project is a State-funded research center located in CPE which involves three Faculty members. The project was established in 1974 and is funded at approximately $1M per annum.

The vast majority of the teaching is conducted by the full-time Faculty or experienced adjunct Faculty. We employ two adjunct Faculty to assist with the teaching of the graduate program.

Graduate student advising is done by the Graduate Advisor who is appointed to provide overview advice to graduate students on their plan of study and progress. This is in addition to guidance which graduate students receive from their research project committee and Chair. The average workload split for CPE Faculty with respect to teaching/research/service is 40/40/20. Individual splits vary according to workload. For example, research Center directors would have a lighter teaching load. This is compensated by Faculty with a lower research load, who take on above average teaching duties. The average teaching load is 3 x 3h courses per year per Faculty member. The Chair of the department is assigned half-normal teaching load. SCHR production per FTE Faculty has increased significantly over the five year period -- from 134.9/FTE in 2004/5 to 279.6/FTE in 2009/10, -- which reflects the increase in undergraduate enrollments.

2B. Quantitative and Qualitative Indicators

Faculty numbers over the last five years fell from a high of twenty-two in 2004 to the current level of sixteen. During this time frame, there were three retirements, two resignations, one transfer to another KU department, and one hire. The change in numbers has been partly due to overlapping appointments in 2003 in anticipation of a retirement, two unexpected resignations and the lack of resources for short term replacement. The mean age of the tenured/tenure track Faculty over the last five years has been in the range of 47.0 – 51.5, which reflects balanced recruitment and replacement over the period 2003-2007 in terms of junior/senior Faculty.

Scholarly outputs have increased significantly over the last five years. The number of archival journal publications per Faculty member per year has risen from 2.3 in 2005 to 7.1 in 2009, which reflects a consistent increase commensurate with the investment in Faculty and significant growth in research resources.

Grants, contracts and research expenditures have shown overall increases in the last five years, with total expenditures rising from $1.24M in 2004, to $2.74M in 2008. Expenditures per FTE Faculty members have increased from $82.7K in 2004 to $144.2K in 2008. The number of research projects has increased from 21 in 2004 to 37 in 2008.
All Faculty members in CPE hold regular membership in the Graduate Faculty. A Graduate Faculty member must continue to show evidence of a pattern of productive professional activity demonstrating the ability to contribute to high-quality graduate education.

2C. Qualitative Indicators – Maintaining Quality – Recruitment and Retention

Our department is well known for its commitment to graduate education, and many Faculty members have received teaching awards. The department received the University of Kansas Center for Teaching Award for Excellence in Teaching for 2004. Recruitment has been tightly focused on areas in which the department has existing strength and with the clear goal of recruiting Faculty who are active in these areas, and who have a strong commitment to undergraduate teaching.

In the last five years, the department has focused its research agenda in the areas of (1) Catalysis and Reaction Engineering (2) Enhanced Oil Recovery and (3) Bioengineering. Faculty members conduct research in one or more of these interdisciplinary areas which encourages a team approach and attainment of critical mass to attract research funding and high quality graduate students. CPE either hosts or is closely connected with four school/university research centers corresponding to our three core areas of research strength. These are (1) The Center for Environmentally Beneficial Catalysis (the Director is a CPE Faculty member) (2) The Tertiary Oil Recovery Project – the director is a CPE Faculty member (3) The Transportation Research Institute (4) and The Bioengineering Research Center. Strong support and encouragement of participation in research center-led programs has proved successful in the motivation and success of our Faculty. In addition, the reputation of the centers has been a vehicle for successful recruitment of high profile Faculty members. There is significant involvement of graduate CPE students in all four research centers.

With regards to Faculty professional development, the department is generally able to support Faculty attendance at learned symposia, conferences, and technical meetings. There is no specific limit on number of trips per year. Faculty may cover their own travel costs using research grant monies or other funds available from University sources. In the absence of those funds, the department supports travel as appropriate. The Dean also provides some travel funds.

All Faculty members are assigned a Faculty mentor who works with their mentees to develop plans for promotion and career advancement. The CPE department has traditionally been very successful at mentoring junior Faculty, largely through start-up support for research, reduced teaching and service duties in early semesters, and through role modeling. CPE policy is that there is annual evaluation of progress toward promotion and tenure. The mentoring system is also available to tenured associate professors, including an annual evaluation of their progress toward promotion. This is in addition to the annual performance appraisal of all Faculty and staff conducted by the department Chair. Testimony to our success in Faculty recruitment and development is that we have a 100% record of promotion and tenure of the five assistant professors put forward since 2004. Two of these promotions were attained one year ahead of schedule. Of the two other Assistant Professors recruited since 2004, one resigned to move to a prestigious position in industry. The other, a joint appointee with the department of Pharmaceutical Chemistry, moved 100% to that department in 2007.

CPE Faculty are also active participants in the programs offered by the KU Center for Teaching Excellence (CTE). The Center offers a series of semester-long seminars that address various topics associated with teaching. The CTE also provides guidance on various tools that Faculty can use to assess teaching performance and effectiveness. Although participation in these is voluntary, many CPE Faculty have taken advantage of this opportunity. One of our Faculty was appointed as a CTE teaching Fellow in 2008. In addition, the Dean of the School of Engineering hosts annual day-long teaching workshops inviting prominent teaching experts as speakers.

CPE also is fortunate to have The Joseph A. and Annabel H. Christy Faculty Scholar endowed program, established in 2001, which recognizes and rewards CPE Faculty members who have demonstrated a commitment and excellence in both education and research. It is intended to promote the continued and expanded efforts of such individuals to make a substantial impact on both: (a) the education of CPE undergraduate and graduate students; and (b) engineering education research. The
award, totaling up to $30K over a two-year period, is given to those individuals who demonstrate a combination of past accomplishments and the potential for future contributions. In 2000, the Raymond Oenbring Award was created to reward teaching excellence among CPE Faculty members and instructors.

The quality of graduate student education in CPE is in the purview of the CPE Graduate Standards Committee which has oversight of student progress. CPE has a Graduate Advisor dedicated to providing independent advice to students on their progress and plan of study. This is in addition to advice which they may receive from their research advisor.

2D. Succession Plan

The Faculty age profile of those qualified to teach in the undergraduate and master’s program in PE is of the highest priority: two out of the four full-time Faculty members are likely to retire within five years; the other two are in the age range of 50-60. In the next two years, we must recruit TWO junior Faculty members if our BS and MS programs in Petroleum Engineering are to be maintained at its current level of quality.

In the ChemE program, the situation is less critical though pressures of increased current and planned enrollments, and greatly increased research commitments over the next five years point to the need for the recruitment of at least three new Faculty members in Chemical Engineering. In addition, we already have a plan to bring in a senior professor of Chemical Engineering as an “eminent scholar” as part of the growth of the CEBC.

3. How well do we do it, and who thinks so?

3A. Test Scores and Entrance Requirements

Graduate programs in chemical and petroleum engineering are for students with baccalaureate degrees in chemical or petroleum engineering. Students with degrees in other branches of engineering or in mathematics, chemistry, physics, the biological sciences, or other sciences may also be admitted and are encouraged to consider the programs. Such students usually take supplementary undergraduate course work to provide the necessary background for graduate courses. Admission to the graduate programs is based on demonstrated potential to complete a graduate degree successfully. The measures of performance used for admission are undergraduate and graduate grade point averages, research performance, letters of recommendation, and Graduate Record Examination scores. Transfer applicants from other institutions are evaluated on a case-by-case basis. The strength of the institution, accreditation status, and the history of other transfer students from that institution are factors in admission decisions. In some cases, a grade-point average higher than that required for continuing engineering students may be required for admission.

The MS degree requires twenty-one course credit hours and nine research credit hours, which includes completion of a research project and the writing of the Master’s thesis. The MS candidate, on completion of the thesis, takes a final oral examination that may cover both course work and the thesis topic. Typical completion time is eighteen to twenty-four months beyond the BS degree. The measures of performance used for admission are undergraduate and graduate grade point averages, research performance, letters of recommendation, and Graduate Record Examination scores.

The PhD degree requires forty-five course credit hours and thirty research credit hours, which includes completion of the comprehensive examination and the defense of a research thesis. Typical completion time is twenty-four to thirty-six months beyond the MS degree.

Admission yields (ratio of admissions: applications) for the PhD program have been variable over the last five years. The ratio of admission-to-enrollments expressed as percentages are as follows: 2005(50%), 2006(40%), 2007(50.0%), 2008(38.9%), 2009(54.5%). Admission yields for the MS ChemE program have been variable over the last five years: 2005(30.8%), 2006(54.2%), 2007(38.5%), 2008(25%), 2009(50%). The ratio of admission to enrollments are as follows: 2005(12.5%), 2006(53.8%), 2007( 50.0%), 2008(66.7%), 2009(100.0%). Admission yields for the MS PE have been
variable over the last 5 years: 2005(6:1), 2006(8:0), 2007(13:2), 2008(24:3), 2009(10:0). Enrollment yield (enrollments: admissions) were as follows: 2005 (0:1), 2006 (0:0), 2007 (1:2), 2008 (1:3), 2009 (0:0).

3B. Financial Support and other Recruitment
Over the last five years, most CPE graduate students have been granted scholarships and GRA/GTA positions from the department, School and University.

3C. Demographics (mean age, number of majors)
The department supports a total of three graduate degree programs: MS in Chemical Engineering, MS in Petroleum Engineering, and PhD in Chemical and Petroleum Engineering. The graduate student cohort was as follows (MS, PhD, Total): 2005 (21,31, 52); 2006 (16, 31, 47); 2007 (19,27,46); 2008 (18,35,53); 2009 (21,34,55). These numbers exclude the Bioengineering graduate students who have been supported and supervised in CPE since fall 2007.

3D. Program Productivity
The mean years to the PhD degree has varied over the review period with no long term trend up or down. The number of PhD degrees awarded in CPE are: one in 2005, one in 2006, four in 2007, two in 2008, and seven in 2009. The mean years to the MS degree in ChemE has remained in the range 2.3 to 3.2 over the review period with no long term trend up or down. The number of MS degrees awarded in ChemE rose from four in 2005 to six in 2009. The mean years to the MS degree in PE has remained in the range 4.3 to 4.7 over the review period with no long term trend. The median time to degree has remained almost constant at 4.0 years the last nine years. The number of MS degrees awarded in PE over the period are as follows: 2005(one), 2006 (seven), 2007(two), 2008(zero), 2009 (zerp).

Student credit hour production per Faculty member for the department increased significantly toward the end of the review period from 134.9 in 2004/5, to 279.6 for 2009/10. Compared with other AAU institutions, and taking account of all instructional Faculty, the CPE SCHR/Faculty values have increased significantly, and now closely correspond to SCHR values for comparable AAU institutions.

4. Program Quality Outcomes

4A. Learner Outcomes
Program Quality Outcomes and educational outcomes are based on quantitative assessment of our program educational objective. This is based primarily on input from our constituents including students, Faculty, alumni, employers and our advisory board. In recent surveys, the majority of those who responded rated the preparation in their graduate program as very good to excellent. These results indicate that our graduates were prepared to attain our program educational objective.

Program outcomes at the graduate-level are based on the following as an advanced level version of those determined for the undergraduate degree in Chemical Engineering, and are listed as follows:

1. Apply advanced engineering sciences to solve chemical and petroleum engineering research problems.
2. Integrate and apply knowledge to solve complex problems.
3. Develop solutions to professional and ethical situations.
4. Evaluate potential risks of engineering solutions on society and environment.
5. Demonstrate proficiency in advanced use of computer software.
6. Effective oral, written, and interpersonal communication skills.
7. Work interactively and efficiently in groups/teams.
8. Demonstrate ability to learn independently, methods of research and life-long learning.
9. Demonstrate competency in advanced chemical engineering.
In addition, PhD graduates are expected to have competence in methods of independent research as demonstrated by the defense of a quantitative PhD thesis, which contains an original contribution to knowledge in the field of Chemical and Petroleum Engineering.

4B. Satisfaction Surveys
Student and Faculty surveys are conducted at the end of each course and are reviewed by the Chair and the Faculty instructor on a yearly basis, and more often, if required. In 2005, the program structure was seen by a significant number of graduate students as being an impediment to progress. This has significantly improved due to changes which were made in 2006 and 2007. Perceptions of program quality and standard of advising also improved over this period.

4C. Placement Rates, Employer Assessments
Placement data are maintained by the School of Engineering Career Services Center. These data are an indication of the demand for students and the perception of industry and graduate programs relative to the quality of the program.
Advisory Board members also meet with graduate students as part of their biannual visit to the department. This is informal, but feedback from the graduate students is sought and is communicated back to the department.

5. Overall Quality

5A. External Indicators of Quality
The Faculty's commitment to both research and teaching has resulted in several honors and awards. Individual Faculty members have been recognized for their professional achievements through awards from the Society of Petroleum Engineers, the American Society of Engineering Education, and the National Research Council. One is a Fellow of the Institution of Chemical Engineers, London and a Fellow of the Institution of Professional Engineers New Zealand. There are thirteen endowed professorships in the School of Engineering, and three are held by members of this department. One holds the Spahr Professorships in the School of Engineering. Two of the Sharp teaching professorships that have been awarded in the School of Engineering in the last six years have been held by our department members. Several of our Faculty have received School and/or University-wide teaching awards, research awards, and service awards. Weatherley was executive editor of the Chemical Engineering Journal for the entire review period.

5B. Reflecting on Short Mission Statement
The graduates from our program play an important role in the State and national economy, and in tertiary education. Many of our graduates also undertake research and development both of which are vital for future state and national economic competitiveness. The influence of CPE ranges into fuels, oil and gas exploration, oil and gas production, refining, chemicals, transportation, alternative energy, advanced materials, biomedical devices, tissue engineering, water treatment, biotechnology, drug design and delivery. Industrial and developing nations also depend upon the fruits of chemical and petroleum engineering research and development for exploitation of their energy and other natural resources. Kansas is an energy-producing state heavily involved in petroleum and natural gas production, and in the processing of industrial chemicals, materials and agricultural chemicals. It is also an important national center for consulting engineering companies who employ significant numbers of chemical engineers at all levels. Opportunities must be available for Faculty and students to pursue technological research to address the needs of the supporting population. Providing such opportunities is consistent with the mission of a comprehensive university such as KU. The PhD program in Chemical and Petroleum Engineering at KU addresses this mission by producing highly trained graduate students for skilled positions in the oil and gas process industries, the chemical industry, and the pharmaceutical industry.
5C. Overall Assessment of Quality of Academic Programming

Graduate programs in CPE are driven by a combination of a strong research culture and a strong commitment to high quality preparation of graduates for employment and professional practice. We rate the quality of the PhD program in CPE to be "exceptional". This is based on (a) the demonstrated teaching, research and service contributions of our Faculty, (b) the strength and diversity of our curriculum, (c) an effective student recruiting and advising system supported by adequate staff, and (d) the overall performance and excellent placement record of our students (e) The strong competitive research funding obtained by Faculty as a consequence of the work conducted by graduate students (f) The strong rate of visible outputs in peer reviewed international research literature. We rate the quality of the MS programs in CPE to be "Very Good". This is based on (a) the demonstrated teaching, research and service contributions of our Faculty, (b) the strength and diversity of our curriculum, (c) an effective student recruiting and advising system supported by adequate staff, and (d) the overall performance and excellent placement record of our students.

6. Plans for Advancement in the Program

6A. Targets for Change

We aim to maintain the excellent record at KU of teaching and research in CPE at the MS and PhD-levels. To ensure steady positive growth of our graduate student numbers and our success rates to meet the School of Engineering target for graduate degrees awarded per year per Faculty member by 2011, we will maintain our recruitment efforts utilizing as far as possible the recruiting resources of the School of Engineering, our website, site visits, socials, and our graduate funding program.

7. Evaluation of Future Progress and Successes

7A. Unit Metrics

We will measure our success in terms of the metrics which we review annually with the Dean the CPE Faculty, and the CPE Advisory Board as follows:

Teaching: Increases as follows:
- Admissions and enrollments in the MS program in Chemical Engineering
- Graduation rates
- Gender and minority balance
- Graduate degree production per Faculty member per annum
- SCHR production per Faculty member
- Years to MS graduation
- Course and teacher evaluations
- Advisory Board feedback and senior exit interview results
- Attraction of new teaching and teaching infrastructure resources
- Employment rates and employer feedback
- Grade point average
- Participation in international programs
- Teaching awards and prizes received by Faculty

Research: Increases as follows (per faculty member per year):
- MS and PhD graduations
- Refereed journal publications
- Refereed conference proceedings
- Patents issues
- Research dollars expended
° New research dollars received
° Research dollars applied for
° Research awards and prizes received
° External invited and other presentations
Executive Summary

The overall mission for the Department of Chemical and Petroleum Engineering (CPE) is to provide a modern chemical or petroleum engineering education with proper balance between theory and practice. Graduates are prepared for professional practice in industry or government, and for post-undergraduate training in chemical or petroleum engineering, medicine, etc., and for research and teaching in higher education. Students also receive training in educational skills, in the humanities, and social sciences. Research and teaching in our department address many of the economic needs of both the State and the nation. Industrial and developing nations also depend upon the fruits of chemical and petroleum engineering research and development for the benefit and stability of their societies. Given the State, national and international significance of the chemical and petroleum engineering disciplines, the PhD program is essential to the School and the University. The CPE Department has a total of sixteen faculty members; thirteen have PhD’s from U.S. institutions, and one each from Canada, India, and United Kingdom universities. All are active in research, and supervise both undergraduate students and graduate students in research projects. The majority of teaching is conducted by the full-time Faculty or experienced adjunct faculty. The research expertise of Faculty covers a range of areas in chemical and petroleum engineering, including a number of non-traditional areas which have emerged in recent years. Faculty recruitment has been tightly focused on areas of existing strength, with the goal of recruiting people active in these areas, and who have a strong commitment to graduate and undergraduate teaching. Scholarly outputs have increased significantly, as have grants, contracts and research expenditures over the last five years. PhD students have been granted scholarships, grants or research assistantships from the Department, School and University. The long-term satisfaction and continuation of employer recruiting also demonstrates that our graduates are very well prepared for industrial or academic careers upon graduation. Perception of program quality and standard of advising have also improved over the period. Demand for CPE graduates has been high over the last five years and student demand for places on our program has also remained strong. We anticipate an increase in the medium term for doctoral students as our strong focus on PhD recruitment continues, in line with School and Departmental strategic plans. The mean years to degree has varied over the review period with no long term trend. The number of PhD degrees awarded in CPE has increased significantly from one in 2005 to eight in 2010. Each area in CPE is driven by a combination of a strong research culture and a strong commitment to high quality preparation of graduates for employment and professional practice. We rate the quality of CPE programs from “very good” to “excellent.”