Harold Vance Department of Petroleum Engineering

http://engineering.tamu.edu/petroleum/

Head: A. D. Hill

Graduate Advisor: I. Y. Akkutlu

The Department of Petroleum Engineering offers graduate degree programs and coursework at both the master’s and doctoral levels. The graduate program in Petroleum Engineering at Texas A&M University is recognized for excellence in teaching and research both nationally and internationally, and this program is consistently rated as one of the best graduate programs in Petroleum Engineering by U.S. News and World Report. Details concerning the faculty, current research projects and technology specialties can be found at our website www.pe.tamu.edu.

Degree Programs

The Department offers traditional MS and PhD degrees that emphasize technical skills and research capabilities and MEng and DEng degrees that emphasize practical engineering skills along with business and management practices. In all degree programs, students who enter with undergraduate degrees (BS or equivalent) in other fields of engineering or closely related study (including physics and geosciences) will be required to take at least three courses from a core curriculum that represents each of the major areas of study in the industry; these courses will count as part of the degree requirement.

Students who enter the program with degrees other than engineering, physics, or geosciences will be required to complete preparatory study at the undergraduate level before beginning graduate coursework. These prerequisite courses will not count toward degree requirements.

Faculty

Abedi Mashhadi, Assistant Professor
Petroleum Engineering
PHD, University of Southern California, 2012

Akkutlu, Ibrahim, Associate Professor
Petroleum Engineering
PHD, University of Southern California, 2002

Ayers, Walter, Visiting Professor
Petroleum Engineering
PHD, University of Texas, 1984

Barrufet, Maria, Professor
Petroleum Engineering
PHD, Texas A&M University, 1987

Blasingame, Thomas, Professor
Petroleum Engineering
PHD, Texas A&M University, 1989

Dattagupta, Akhil, Professor
Petroleum Engineering
PHD, University of Texas, 1992

Dupriest, Fred, Professor Of The Practice
Petroleum Engineering
BS, Texas A&M University, 1977

Ehlig-Economides, Christine, Professor
Petroleum Engineering
PhD, Stanford University, 1979

Gildin, Eduardo, Associate Professor
Petroleum Engineering
PhD, University of Texas, 2006

Hasan, Abu, Professor
Petroleum Engineering
PHD, University of Waterloo, 1979

Hascakir, Berna, Assistant Professor
Petroleum Engineering
PHD, Middle East Technical University, 2008

Heidari, Zoya, Assistant Professor
Petroleum Engineering
PHD, University of Texas, Austin, 2011

Hill, Alfred, Professor
Petroleum Engineering
PHD, University of Texas, 1978

Holditch, Stephen, Tees Distinguished Research Professor
Petroleum Engineering
PHD, Texas A&M University, 1976

Kelessidis, Vassilios, Professor
Petroleum Engineering
PHD, University of Houston, 1986

Killough, John, Professor
Petroleum Engineering
PHD, Rice University, 1986

Kim, Jihoon, Assistant Professor
Petroleum Engineering
PHD, Stanford University, 2010

King, Michael, Professor
Petroleum Engineering
PHD, Syracuse University, 1980

Lane, Robert, Professor
Petroleum Engineering
PHD, University of Florida, 1971

Lee, William, Professor
Petroleum Engineering
PHD, Georgia Institute of Technology, 1963

Liang, Jenn, Professor
Petroleum Engineering
PHD, University of Texas, Austin, 1988
Lin, Jiajing, Lecturer
Petroleum Engineering
PHD, Texas A&M University, 2011

Maggard, Bryan, Senior Lecturer
Petroleum Engineering
PHD, Texas A&M University, 2000

McCain, William, Visiting Professor
Petroleum Engineering
PHD, Georgia Institute of Technology, 1964

McLeroy, Priscilla, Professor Of The Practice
Petroleum Engineering
MEN, Stanford University, 1986

McVay, Duane, Professor
Petroleum Engineering
PHD, Texas A&M University, 1994

Moridis, George, Visiting Professor
Petroleum Engineering
PHD, Texas A&M University, 1987

Morita, Nobuo, Professor
Petroleum Engineering
PHD, The University of Texas at Austin, 1974

Nascentes Alves,, Professor Of The Practice
Petroleum Engineering
PHD, University of Tulsa, 1991

Nasr-El-Din, Hisham, Professor
Petroleum Engineering
PHD, University of Saskatchewan, 1984

Nasrabadi, Hadi, Assistant Professor
Petroleum Engineering
PHD, Imperial College, London, 2006

Noynaert, Samuel, Assistant Professor
Petroleum Engineering
PHD, Texas A&M University, 2013

Reed, Teri, Associate Professor
Petroleum Engineering
PHD, Arizona State University, 1999

Rodrigues De, Professor Of The Practice
Petroleum Engineering
PHD, Texas A&M University, 1998

Schechter, David, Associate Professor
Petroleum Engineering
PHD, Brisol University, United Kingdom, 1989

Schubert, Jerome, Associate Professor
Petroleum Engineering
PHD, Texas A&M University, 1999

Teodoriu, Catalin, Associate Professor
Petroleum Engineering
PHD, Technische Universitat Clausthal, 2003

Valko, Peter, Professor
Petroleum Engineering
PHD, Institute of Catalysis, 1981

Voneiff, George, Professor Of The Practice
Petroleum Engineering
MS, Texas A&M University, 1992

Wang, Sophie, Graduate Assistant Teaching
Petroleum Engineering
PHD, Texas A&M University, College Station, 2015

Weijermars, Rudy, Professor
Petroleum Engineering
PHD, University of Uppsala, 1987

Wu, Kan, Assistant Professor
Petroleum Engineering
PHD, The University of Texas at Austin, 2014

Zhu, Ding, Professor
Petroleum Engineering
PHD, University of Texas, 1992

Masters
• Master of Engineering in Petroleum Engineering
• Master of Science in Petroleum Engineering

Doctoral
• Doctor of Philosophy in Petroleum Engineering

Certificates
• Certificate in Energy Sustainability Engineering

Courses
PETE 602 Well Stimulation
Credits 3. 3 Lecture Hours.
Design and analysis of well stimulation methods, including acidizing and hydraulic fracturing; causes and solutions to low well productivity.

PETE 603 Advanced Reservoir Engineering I
Credits 3. 3 Lecture Hours.
Petroleum reservoir simulation basics including solution techniques for explicit problems.

PETE 604 Advanced Reservoir Engineering II
Credits 3. 3 Lecture Hours.
Advanced petroleum reservoir simulation with generalized methods of solution for implicit problems.
Prerequisite: PETE 603.

PETE 605 Phase Behavior of Petroleum Reservoir Fluids
Credits 3. 3 Lecture Hours.
Pressure, volume, temperature, composition relationships of petroleum reservoir fluids.

PETE 606 EOR Methods—Thermal
Credits 3. 3 Lecture Hours.
Fundamentals of enhanced oil recovery (EOR) methods and applications of thermal recovery methods.
Prerequisite: PETE 323.
PETE 608 Well Logging Methods
Credits 3.3 Lecture Hours. 
Well logging methods for determining nature and fluid content of formations penetrated by drilling. Development of computer models for log analysis.

PETE 609 Enhanced Oil Recovery Processes
Credits 3.3 Lecture Hours. 
Fundamentals and theory of enhanced oil recovery; polymer flooding, surfactant flooding, miscible gas flooding and steam flooding; application of fractional flow theory; strategies and displacement performance calculations.
Prerequisite: PETE 323.

PETE 611 Application of Petroleum Reservoir Simulation
Credits 3.3 Lecture Hours. 
Use of simulators to solve reservoir engineering problems too complex for classical analytical techniques.
Prerequisites: PETE 400 and PETE 401.

PETE 612 Unconventional Oil and Gas Reservoirs
Credits 3.3 Lecture Hours. 
As conventional oil and gas resources are depleted, unconventional resources, including heavy oil and gas from low-permeability sandstones, fractured shales, coal bed, and hydrates, will assume greater roles in meeting USA and world energy demands; this course emphasizes resources, geologic and geographic occurrences, recovery technology and economics of unconventional hydrocarbon resources.
Prerequisite: Graduate classification in petroleum engineering, geology or geophysics.

PETE 613 Natural Gas Engineering
Credits 3.3 Lecture Hours. 
Flow of natural gas in reservoirs and in wellbores and gathering systems; deliverability testing; production forecasting and decline curves; flow measurement and compressor sizing.
Prerequisites: PETE 323 and PETE 324.

PETE 616 Engineering Near-Critical Reservoirs
Credits 3.3 Lecture Hours. 
Identification of reservoir fluid type; calculation of original gas in place, original oil in place, reserves and future performance of retrograde gas and volatile oil reservoirs.
Prerequisites: PETE 323, PETE 400, PETE 401.

PETE 617 Petroleum Reservoir Management
Credits 3.3 Lecture Hours. 
The principles of reservoir management and application to specific reservoirs based on case studies presented in the petroleum literature.

PETE 618 Modern Petroleum Production
Credits 3.3 Lecture Hours. 
An advanced treatment of modern petroleum production engineering encompassing well deliverability from vertical, horizontal and multilateral/multibranch wells; diagnosis of well performance includes elements of well testing and production logging; in this course the function of the production engineer is envisioned in the context of well design, stimulation and artificial lift.

PETE 619 Naturally Fractured Reservoirs
Credits 3.3 Lecture Hours. 
Explore all relevant subject matter in naturally fractured reservoirs; naturally fractured reservoirs are commonplace throughout the world, however there is a general lack of understanding of such reservoirs; provides the background for all relevant topics such as characterization, fluid flow, simulation and enhanced oil recovery.
Prerequisite: Approval of instructor.

PETE 620 Fluid Flow in Petroleum Reservoirs
Credits 3.3 Lecture Hours. 
Analysis of fluid flow in bounded and unbounded reservoirs, wellbore storage, phase redistribution, finite and infinite conductivity fractures; dual-porosity systems.
Prerequisite: PETE 323.

PETE 621 Petroleum Development Strategy
Credits 3.2 Lecture Hours. 3 Lab Hours. 
Applications of the variables, models and decision criteria used in modern petroleum development; case approach used to study major projects such as offshore development and assisted recovery. Both commercial and student-prepared computer software used during the lab sessions to practice methods.

PETE 622 Exploration and Production Evaluation
Credits 3.2 Lecture Hours. 3 Lab Hours. 
Selected topics in oil industry economic evaluation including offshore bidding, project ranking and selection, capital budgeting, long-term oil and gas field development projects and incremental analysis for assisted recovery and acceleration.

PETE 623 Waterflooding
Credits 3.3 Lecture Hours. 
Design, surveillance and project management of waterfloods in reservoirs.
Prerequisite: PETE 323.

PETE 624 Rock Mechanic Aspects of Petroleum Reservoir Response
Credits 3.3 Lecture Hours. 
Reservoir rocks and their physical behavior; porous media and fracture flow models; influence of rock deformability, stress, fluid pressure and temperature.
Prerequisite: PETE 604.

PETE 625 Well Control
Credits 3.3 Lecture Hours. 
Theory of pressure control in drilling operations and during well kicks; abnormal pressure detection and fracture gradient determination; casing setting depth selection and advanced casing design; theory supplemented on well control simulators.
Prerequisites: PETE 411.

PETE 626 Offshore Drilling
Credits 3.3 Lecture Hours. 
Offshore drilling from fixed and floating drilling structures; directional drilling including horizontal drilling; theory of deviation monitoring and control.
Prerequisite: PETE 411.

PETE 627 Well Completion and Workover
Credits 3.3 Lecture Hours. 
Development of design options, systems and procedures to meet deliverability, safety and integrity requirements for completions and workover equipment; overview of methods in the oil and gas industry; function and design criteria of well components.
Prerequisite: Graduate classification.
PETE 628 Horizontal Drilling  
**Credits 3.3 Lecture Hours.**  
Changing a wellbore from vertical to horizontal; long- and short-radius horizontal wells; bottomhole assemblies for achieving and maintaining control of inclination and direction; drilling fluids; torque and drag calculations; transport of drilled solids.  
**Prerequisite:** PETE 411.

PETE 629 Advanced Hydraulic Fracturing  
**Credits 3.3 Lecture Hours.**  
Physical principles and engineering methods involved in hydraulic fracturing; an advanced treatise integrating the necessary fundamentals from elasticity theory, fracture mechanics and fluid mechanics to understand designs, optimization and evaluate hydraulic fracturing treatments including special topics such as high permeability fracturing and deviated well fracturing.

PETE 630 Geostatistics  
**Credits 3.3 Lecture Hours.**  
Introductory and advanced concepts in geostatistics for petroleum reservoir characterization by integrating static (cores/logs/seismic traces) and dynamic (flow/transport) data; variograms and spatial correlations; regionalized variables; intrinsic random functions; kriging/cokriging; conditional simulation; non-Gaussian approaches.  
**Prerequisite:** Introductory course in statistics or PETE 322.

PETE 631 Petroleum Reservoir Description  
**Credits 3.3 Lecture Hours.**  
Engineering and geological evaluation techniques to define the extent and internal character of a petroleum reservoir; estimate depositional environment(s) during the formation of the sedimentary section and resulting effects on reservoir character.  
**Prerequisites:** PETE 324 and PETE 620.

PETE 632 Physical and Engineering Properties of Rock  
**Credits 4.3 Lecture Hours. 3 Lab Hours.**  
Physical and engineering properties of rock and rock masses including strength, deformation, fluid flow, thermal and electrical properties as a function of the subsurface temperature, in-situ stress, pore fluid pressure and chemical environment; relationship of rock properties to logging, siting and design of wells and structures in rock.

PETE 633 Data Integration for Petroleum Reservoirs  
**Credits 3.3 Lecture Hours.**  
Introduction and application of techniques that can be used to incorporate dynamic reservoir behavior into stochastic reservoir characterizations; dynamic data in the form of pressure transient tests, tracer tests, multiphase production histories or interpreted 4-D seismic information.  
**Prerequisites:** PETE 620; STAT 601.

PETE 635 Underbalanced and Managed Pressure Drilling  
**Credits 3.3 Lecture Hours.**  
This course provides an introduction and application of techniques utilized in underbalanced and managed pressure drilling; includes equipment, types of drilling fluids used (air, mist foam, etc.), flow drilling, mud cap drilling and hydraulics calculations.  
**Prerequisite:** Graduate classification.

PETE 636 Horizontal, Multilateral and Intelligent Wells  
**Credits 3.3 Lecture Hours.**  
Advanced well architectures, primarily horizontal, multilateral and intelligent wells, all aspects of these types of wells, including well completions, reservoir flow, and wellbore flow conditions, and well deliverability; optimization of well design and field applications will be demonstrated with field cases.  
**Prerequisites:** PETE 662; graduate classification.

PETE 637 Streamline Simulation  
**Credits 3.3 Lecture Hours.**  
Introductory and advanced concepts in streamline simulation and its applications; theory of streamlines/streamtubes in multidimensions; topics include: streamline, streamtubes, streamfunctions, transport along streamlines, spatial discretization and material balance, time stepping and transverse fluxes, impact of cell geometry, history matching and production data integration, comparison with finite difference.  
**Prerequisite:** Graduate classification.

PETE 638 Production Logging  
**Credits 3.3 Lecture Hours.**  
Well logging methods concerned with problem well diagnosis and reservoir surveillance; includes fluid flow in pipes, understanding fluid dynamics in a wellbore, theoretical basis of production logging techniques, production log interpretation techniques, and operational considerations.  
**Prerequisite:** Graduate classification.

PETE 639 High Performance Drilling Design and Operational Practices  
**Credits 3.3 Lecture Hours.**  
Achieving differentiating drilling performance in most complex wells; includes physics of each type of performance limiter, real time operational practices, engineering redesign practices, and effective workfows to achieve the required change in engineering and operational practices.  
**Prerequisites:** Graduate classification; PETE 355 or PETE 661 or approval of instructor.

PETE 640 Models for Simulation of Flow and Transport of Fluids and Heat in Porous Media  
**Credits 4.3 Lecture Hours. 3 Lab Hours.**  
Design and develop numerical simulators that describe flow of reservoir fluids and transport of heat through porous media; develop multi-dimensional models capable of handling single mass components (gas, oil or water) in single phases (liquid or vapor).  
**Prerequisites:** PETE 603 or approval of instructor; experience in FORTRAN or another programming language; solid understanding of physical processes of flow and transport through porous media, numerical analysis and linear algebra; graduate classification.

PETE 641 Models for Simulation of Advanced Coupled Processes in Geologic Media  
**Credits 4.3 Lecture Hours. 3 Lab Hours.**  
Design and develop advanced multi-phase flow processes and complex geologic media (porous and fractured, with matrix-fracture interactions); structured and unstructured grids, multiple mass components (gas, oil and water) in multi-phase states (liquid, vapor and/or liquid-vapor), and phase changes.  
**Prerequisites:** PETE 640 and graduate classification; experience in FORTRAN85, C, C++ or another programming language; solid understanding of physical processes of flow and transport through porous media, numerical analysis and linear algebra.

PETE 642 Formation Damage: Mechanisms and Remediation  
**Credits 3.3 Lecture Hours.**  
Identification and development of solutions for mechanisms of formation damage that can occur during drilling, completion, and following chemical treatments; includes interaction of cleaning fluids with the formation brines, rock and oil.  
**Prerequisites:** Graduate classification.
PETE 643 Oil Field Chemistry  
Credits 3.3 Lecture Hours.  
The role of chemistry in well stimulation, water shut-off treatments, scale removal, mitigation, downhole corrosion issues, organic deposition, dewatering, drilling fluids and various aspects of formation damage; includes problem identification as the first step in designing chemical treatment to remove formation damage.  
Prerequisite: Graduate classification.

PETE 644 CO2 Capture and Uses: Sequestration, Enhanced Oil Recovery (EOR)  
Credits 3.3 Lecture Hours.  
Understanding the need and potential of CO2 captures and uses, including sequestration and Enhanced Oil Recovery (CCS-EOR), the scientific, technological and economic aspects of identifying and implementing a CCS-EOR; overview of safety, environmental and legal aspects.  
Prerequisite: Graduate classification.

PETE 645 Upscaling of Geologic Models for Flow Simulation  
Credits 3.3 Lecture Hours.  
In-depth understanding of current approaches to upscaling of 3D geologic models for reservoir flow simulation; includes development of upscaling solvers.  
Prerequisite: Graduate classification.

PETE 646 Reservoir Characterization and Forecasting  
Credits 3.3 Lecture Hours.  
Emphasis on geostatistical estimation/simulation and advanced mathematical inversion methods; integration of three important aspects of reservoir development and management: i) stochastic reservoir description, ii) reservoir model updating; and iii) model-predictive reservoir control and management.  
Prerequisite: Graduate classification; basic familiarity with linear algebra, probability, statistics, differential and integral calculus and general reservoir engineering.

PETE 648 Pressure Transient Testing  
Credits 3.3 Lecture Hours.  
Diffusivity equation and solutions for slightly compressible liquids; dimensionless variables; type curves; applications of solutions to buildup, drawdown, multi-rate, interference, pulse and deliverability tests; extensions to multiphase flow; analysis of hydraulically fractured wells.  
Prerequisite: PETE 324 and PETE 620.

PETE 650 Advanced Drilling Engineering  
Credits 3.3 Lecture Hours.  
Underbalanced drilling techniques, offshore drilling; horizontal, extended reach and multilateral drilling and fishing operations; geothermal drilling and high pressure, high temperature drilling.  
Prerequisite: PETE 405 or equivalent basic drilling engineering.

PETE 656 Advanced Numerical Methods for Reservoir Simulation  
Credits 3.3 Lecture Hours.  
Numerical simulation of flow in porous media based on numerical methods for partial differential equations; supplemented by published papers and research topics; development of a reservoir simulator.  
Prerequisite: Graduate classification; basic reservoir simulation or equivalent course; linear algebra and matrix computations or equivalent course; advanced calculus or equivalent course; programming experience.

PETE 657/CSCE 657 High Performance Computing for Earth Science and Petroleum Engineering  
Credits 3.3 Lecture Hours.  
Numerical simulation of problems in Earth Sciences and Petroleum Engineering using high performance computing (HPC); development of a parallel reservoir simulator.  
Prerequisite: Graduate classification.  
Cross Listing: CSCE 657/PETE 657.

PETE 658 Energy and Sustainability  
Credits 3.3 Lecture Hours.  
Overview of energy resources and use with emphasis on long-term sustainability; considers fossil, nuclear, and alternative energy sources, electricity and transportation, energy conversions, energy efficiency, energy security, energy policy, and environmental impact.  
Prerequisite: Graduate classification.

PETE 661 Drilling Engineering  
Credits 3.3 Lecture Hours.  
Introduction to drilling systems: wellbore hydraulics; identification and solution of drilling problems; well cementing; drilling of directional and horizontal wells; wellbore surveying abnormal pore pressure, fracture gradients, well control; offshore drilling, underbalanced drilling.

PETE 662 Production Engineering  
Credits 3.3 Lecture Hours.  
Development of fundamental skills for the design and evaluation of well completions, monitoring and management of the producing well, selection and design of article lift methods, modeling and design of surface facilities.

PETE 664 Reservoir Engineering  
Credits 3.3 Lecture Hours.  
Reservoir description techniques using petrophysical and fluid properties; engineering methods to determine fluids in place, identify production-drive mechanisms, and forecast reservoir performance; implementation of pressure-maintenance schemes and secondary recovery.  
Prerequisite: Approval of instructor or graduate classification.

PETE 666 Petroleum Project Evaluation and Management  
Credits 3.3 Lecture Hours.  
Introduction to oil industry economics, including reserves estimation and classification-, building and using reservoir models, developing and using reservoir management processes, managing new and mature fields, and investment ranking and selections.

PETE 667 Petroleum Reservoir Engineering  
Credits 3.3 Lecture Hours.  
Reservoir description techniques using petrophysical and fluid properties; engineering methods to determine fluids in place, identify production-drive mechanisms, and forecast reservoir performance; implementation of pressure-maintenance schemes and secondary recovery.  
Prerequisite: Approval of instructor or graduate classification.

PETE 667 Petroleum Engineering Reserves and Evaluation  
Credits 3.3 Lecture Hours.  
Estimation and valuation of hydrocarbon reserves and resources, with emphasis on probabilistic methods, technically challenging reservoirs, and unconventional resources.  
Prerequisite: PETE 664, approval of instructor.
PETE 681 Seminar  
Credit 1. 1 Lecture Hour.  
Study and presentation of papers on recent developments in petroleum technology.

PETE 684 Professional Internship  
Credits 1 to 4. 1 to 4 Other Hours.  
Training under the supervision of practicing professional engineers in settings appropriate to the student's professional objectives. May be taken four times for credit.  
Prerequisite: Graduate classification and one semester of graduate work completed.

PETE 685 Directed Studies  
Credits 1 to 12. 1 to 12 Other Hours.  
Students undertake and complete limited investigations not within their thesis research and not covered in established curricula.  
Prerequisites: Graduate classification; approval of instructor.

PETE 689 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Special topics in an identified area of petroleum engineering. May be repeated for credit.

PETE 691 Research  
Credits 1 to 23. 1 to 23 Other Hours.  
Advanced work on some special problem within field of petroleum engineering. Thesis course.

PETE 692 Professional Study  
Credits 1 to 12. 1 to 12 Other Hours.  
Approved professional study or project. May be taken more than once but not to exceed 6 hours of credit towards a degree.