PETROLEUM ENGINEERING (PETE)

PETE 3101 Drilling Engineering I Lab
Preparation, testing and control of rotary drilling fluid systems. API recommended diagnostic testing of drilling fluids for measuring the physical properties of drilling fluids, cements and additives. A laboratory study of the functions and applications of drilling and well completion fluids. Learning the rig floor simulator for drilling operations that virtually resembles the drilling and well control exercises.
Corequisites: PETE 3301

PETE 3110 Petrophysics Lab
Hands-on Laboratory study of reservoir rock and rock-fluid interaction fundamentals, including porosity, rock strength, absolute permeability, wettability, capillary pressure, fluid saturation, and relative permeability.
Corequisites: PETE 3310

PETE 3111 Well Log & Formation Eval Lab
Observation of well logging tools and recording devices; Laboratory investigation of core analysis (routine core, special core, and thin section) for different formations. Interpretation of borehole surveys to determine formation character, fluid content, and production potential. Measurement of electrical, radioactive, acoustic, magnetic properties of rocks and fluids; The spontaneous potential log, gamma-ray log, porosity logs, nuclear magnetic resonance (NMR) log, and caliper log. Formation evaluation field-case studies using commercial software on different types of formations by interpretation of resistivity logs, spontaneous potential log, gamma-ray log, porosity logs, nuclear magnetic resonance (NMR) log, and caliper log.
Corequisites: PETE 3311

PETE 3120 Petroleum Production Eng I Lab
Laboratory investigation of produced fluid treatment and separation problems. Engineering solutions to petroleum production problems. Investigation of multiphase flow and pipeline fluid flow. Petroleum production system analysis using commercial simulator.
Corequisites: PETE 3320

PETE 3301 Drilling Engineering I
Introduction to petroleum drilling systems, including fundamental petroleum engineering concepts, quantities and unit systems, drilling rig components, drilling fluids, pressure loss calculations, casing, well cementing, and directional drilling.
Prerequisites: ENGR 2390.
Corequisites: PETE 3101.

PETE 3307 Reservoir Engineering I
Fundamental properties of reservoir formations and fluids including reservoir volumetric, reservoir statics and dynamics. Analysis of Darcy's law and the mechanics of single and multiphase fluid flow through reservoir rock, capillary phenomena, material balance, and reservoir drive mechanisms.
Prerequisites: PETE 3310 and PETE 3311

PETE 3310 Petrophysics
The course is designed to equip students with the skills necessary for accurate reservoir characterization and assessment through a systematic theoretical study of reservoir rock-fluid interaction fundamentals. Reservoir rock characteristics include lithology, porosity, elastic properties, rock strength, electrical properties, Darcy's Law, and absolute permeability. It also delves into the rock-fluid interaction characteristics that contribute to the fluid flow in porous media, including the existence of multi-phases, relative and effective permeability, fluid saturations, capillary characteristics, wettability, adsorption, and absorption processes.
Prerequisites: CHEM 1311, ENGR 2305, and MATH 2415.
Corequisites: PETE 3110

PETE 3311 Well Log & Formation Eval
This course covers topics on methods of how to measure and interpret the physical and chemical properties of formation through the well logging tools. Fundamental principles of the use of borehole surveys to evaluate the formation characteristics and fluid contents of porous strata; well-log interpretation for formation evaluation of hydrocarbon-bearing reservoirs; basic rock physics principles; theory of tool operation; analysis of open-hole logs and core measurements to estimate hydrocarbon reserves and petrophysical properties of the formation such as porosity, net pay thickness, water/hydrocarbon saturation, permeability, and saturation-dependent capillary pressure; formation evaluation of clay-free and shaly-sand formations as well as basic introduction to formation evaluation of organic-shale formations. Measurement principles, test types, and application of wireline Formation Testing, Production logging; Core analysis techniques; Integration of core analysis; Well logging results for reservoir modeling.
Prerequisites: ENGR 2390, GEOL 3420, PHYS 2326, and PHYS 2126.
Corequisites: PETE 3111.

PETE 3320 Petroleum Production Eng I
Introduction to production operations, production systems, and oil field equipment; inflow performance analysis, effect of formation damage on well flow, nodal systems analysis; perforating techniques and their effect on inflow; and stimulation treatments to enhance well performance; production problems; Well stimulation design and workover and recompletion analysis. Design of surface separation and treating facilities.
Prerequisites: PETE 3310.
Corequisites: PETE 3120

PETE 3330 Reservoir Fluids
This course is designed to provide students with the fundamentals of thermodynamic behavior of naturally occurring hydrocarbon mixtures, evaluation, and correlation of physical properties of petroleum reservoir fluids, including laboratory and empirical methods. This introduction to reservoir fluid properties covers all the basic concepts and applications of fluid properties (PVT), including fluid composition, properties, types, fluid sampling, measurement, analysis, PVT laboratory experiments and PT report analysis for further use in reservoir engineering.
Prerequisites: ENGR 2360

PETE 3340 Geophysics for Petro Engineers
The fundamentals of geophysics are given to petroleum engineering students, with special emphasis on 2-D and 3-D seismic. Application of seismic to oil and gas exploration problems.
Prerequisites: GEOL 3320

PETE 4152 Internship in PETE
A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.
Prerequisites: Instructor approval

PETE 4185 Special Topics in PETE
This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.
Prerequisites: Senior standing or permission of instructor

PETE 4190 Senior Design I
This is the first course in the senior design sequence. This course provides students the experience of devising a system, component, or process to address predefined needs and requirements within constraints, such as time, cost, technology, etc. Students are expected to propose an iterative and innovative engineered design solution for implementation in PETE 4290. This course should be taken the semester preceding PETE 4290.
Prerequisites: ENGL 2311 and Senior Standing.

PETE 4195 Undergraduate Research in PETE
Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis. May be repeated twice for credit.
Prerequisites: Instructor Approval

PETE 4199 Directed Study in PETE
A directed study course. Topics selected from contemporary developments in the field of petroleum engineering. May be repeated twice for credit.
Prerequisites: Permission of instructor

PETE 4252 Internship in PETE
A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.
Prerequisites: Instructor approval

PETE 4285 Special Topics in PETE
This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.
Prerequisites: Senior standing or permission of instructor

PETE 4290 Senior Design II
This course is the second and final course in the senior design sequence. This course provides students the experience of implementing (including building, testing, and documenting) the approved project in PETE 4190, within budget and on schedule. Requires integration of knowledge from required petroleum engineering courses. Course requirements include a written report and oral presentation.
Prerequisites: PETE 4190

PETE 4295 Undergraduate Research in PETE
Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis.
Prerequisites: Instructor Approval

PETE 4299 Directed Study in PETE
A directed study course. Topics selected from contemporary developments in the field of petroleum engineering.
Prerequisites: Permission of instructor

PETE 4302 Drilling Engineering II
This course addresses the current advancement and technologies applied in modern drilling designs. The course focuses on building and designing directional well paths, wellbore surveying methods, predicting dog-leg severity, bottom hole assembly and operational techniques used in directional drilling, limiting factors and wellbore issues associated with directional drilling.
Prerequisites: PETE 3301

PETE 4312 Reservoir Engineering II
Determination of reserves; material balance methods; aquifer models; fractional flow and frontal advance; displacement, pattern, and vertical sweep efficiencies in water floods; enhanced oil recovery processes; design of optimal recovery processes.
Prerequisites: PETE 3307

PETE 4313 Integrated Reservoir Mngt
Principles of reservoir management and applications to specific reservoirs. Examine case studies that include new fields, mature fields, water floods and enhanced recovery projects. Requirements for successful operation of a reservoir through integration of people, technology, tools and data, synergy, fostering teamwork and integration.
Prerequisites: PETE 3301, PETE 3307, and PETE 3320

PETE 4321 Petroleum Production Eng. II
Fundamental production engineering design, evaluation and optimization for oil and gas wells, including well deliverability, formation damage and skin analysis, completion performance, and technologies that improve oil and gas well performance (artificial lift and well stimulation).
Prerequisites: PETE 3320.

PETE 4322 Artificial Lift
Fundamentals of artificial lift. Design, Evaluation and Optimization of different methods: Beam pumping, Electric submersible pumps and Gas lift. Equipment and installations required at the field. Case studies in different types of petroleum fields.
Prerequisites: PETE 3320

PETE 4330 Petroleum Data Analytics & ML

Data analytics knowledge appropriate for petroleum engineers and geoscientists; emphasis on implementing data-driven methods on various types of subsurface data; assembly of data-driven workflows and application of them on various types of subsurface data generated during petroleum engineering and geoscience operations and work on case studies that integrate various domains of petroleum engineering and geoscience; emphasis on the use of supervised learning, classification and regression, unsupervised learning, transformations, clustering, and feature extraction, and neural networks using open-source Python computational platforms; facilitation of understanding the basics of machine learning, data science and data analysis and their applications to petroleum engineering and geoscience.

Prerequisites: ENGR 2372 and Junior Standing

PETE 4332 Env Hlth & Saf in Oil Indus

This course analyzes U.S. laws, and how regulatory agencies address compliance concerns in the oil and gas industry. Attention will be paid to health, safety, and environmental concerns.

PETE 4352 Internship in PETE

A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor approval

PETE 4355 Drilling Optimization

Optimization of the drilling process for oil and gas well based on geo-mechanical and dynamical models. Topics to be covered include drilling hydraulics, drill bit selection, operating parameter selection, analysis of drilling time and cost, and rate of penetration predications.

Prerequisites: PETE 4302

PETE 4370 Well Testing

Well test objectives and principles. Basics of Well Test Interpretation; Pressure transient tests and interpretation methods, unsteady-state fluid flow through porous rock, analysis of the drawdown and buildup tests, wellbore storage, application of pressure derivative in pressure transient data analysis, testing of hydraulically fractured wells, type curve methods, testing of horizontal wells, unified method of analysis, well test design, case studies of local field examples using well test commercial simulator; basics of specialized well test including Interference, pulse and vertical permeability testing, drill stem test (DST); Reservoir limit test; Wire line and slick line formation tests; Repeat formation tester (RFT).

Prerequisites: PETE 3307, PETE 3311, and PETE 3320

PETE 4380 Shale Oil & Gas Engineering

Overview of the unconventional basins and plays – North America, the rest of the world and Emerging basins; characteristics of unconventional oil and gas resources; unconventional resources workflow – exploration, identification, characterization, economics, efficient completion technologies, challenges, and development strategies. Pilot project in Shale resources development.

Prerequisites: PETE 3307 and PETE 3311

PETE 4382 Reserv Modeling & Simulation

Introduction to the fundamentals and applications of reservoir molding and simulation. In this class, numerical models are built based on finite-difference and finite-volume approximations of governing equations of fluid flow in porous media, which integrate conservation of mass, isothermal fluid PVT behavior, and Darcy's flow approximations.

Prerequisites: PETE 3307 and PETE 3320.

PETE 4385 Special Topics in PETE

This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.

PETE 4395 Undergraduate Research in PETE

Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor Approval

PETE 4399 Directed Study in PETE

A directed study course. Topics selected from contemporary developments in the field of petroleum engineering.

Prerequisites: Permission of instructor