

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 Res Rock & Fluid Propert Lab

Experimental study of oil reservoir rocks and fluids and their interrelation applied to petroleum reservoir engineering.

Corequisites: PETE 3310

PETE 3111 Formation Evaluation 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 3300 Petroleum Economics

Principles of engineering economics including economic equivalence, time value of money, analysis of single and multiple investments, comparison of alternatives; public sector analysis and break-even concept; estimation of oil and gas reserves and their uncertainty including tangible and intangible investment costs, depreciation, economic analysis of producing wells, income tax consideration; probabilistic determination of different prospects; petroleum project economics, risk and uncertainty analysis, property evaluation and management; economic factors affecting petroleum production and investment opportunities.

Prerequisites: MATH 2414

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 2380, ENGR 2390, and GEOL 3320.

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 Res Rock & Fluid Properties

Introduction to basic reservoir rock and fluid properties and the interaction between rocks and fluids in a reservoir. The course is divided into three sections: rock properties, rock and fluid properties (interaction between rock and fluids), and fluid properties. The rock properties introduce the concepts of, Lithology of Reservoirs, Porosity and Permeability of Rocks, Darcy's Law, and Distribution of Rock Properties. While the Rock and Fluid Properties Section covers the concepts of, Existence of Multi-phases, Saturation, Wettability, Capillary Pressure, Effective and Relative Permeability. Furthermore, the Fluid properties topics include Phase Behavior of Single and Multi-Component Systems, Compositional and Black-Oil models, Solution Gas-Oil Ratios, Formation Volume Factor, Compressibility, Density, Viscosity, and Interfacial Tension.

Prerequisites: ENGR 2380 and GEOL 3320.

Corequisites: PETE 3110

PETE 3311 Formation Evaluation

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: PHYS 2326, ENGR 2390, and GEOL 3320.

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 3307 and PETE 3310.

Corequisites: PETE 3120

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: ENGR 2380 and GEOL 3320

PETE 4190 Senior Eng Capstone Proposal

Introduction to principles of engineering design as applied to petroleum projects. This course is the first course in two courses series to develop the final capstone-engineering project focusing on shale oil and gas. The course focuses on the application of the concepts of reservoir, production, drilling and completions, and economics to petroleum engineering design projects. In this course, students will apply their gained knowledge to develop a proposal of their capstone design project. Alongside with the proposal students will develop the geological model of their selected formation to be used in the second course of the capstone design project. The class will be divided into teams and students will be evaluated based on their contribution to the team effort. All reports and presentations will be presented as a product of the team.

PETE 4290 Senior Eng Capstone Design

Integration of reservoir engineering and modeling for field development plan in unconventional formation. This course is the second course in two courses series to develop the final capstone-engineering project focusing on shale oil and gas. The course focuses on the testing and optimizing production design and strategy, drilling and completions, and economics of the pre-proposed project. In this course, students will apply their knowledge in reservoir modeling to test and optimize their capstone design to maximize its net present value. The class are divided into teams, each team must prepare a complete technical report of their project including all the conducted steps and results. Each group will present their project in form of a presentation and poster. Students will be evaluated based on their contribution to the team effort. All reports and presentations will be presented as a product of the team.

Prerequisites: Must be taken the semester prior to graduation

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 4312

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 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 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 modeling 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, PETE 3310, and PETE 3320