

Geology (GEOL)

- 104. Physical Geology. (3-3). Credit 4.** Earth materials, structures, external and internal characteristics; physical processes at work upon or within the planet; required for students in geology, geophysics, and petroleum engineering. A working knowledge of high school chemistry and mathematics is required.*
- 285. Directed Studies. Credit 1 to 4.** Directed studies in specific problem areas of geology. Prerequisite: Approval of instructor.
- 300. Field Geology. Credit 6.** Basic concepts of field relationships and field techniques are used to develop geologic maps, stratigraphic columns, cross-sections, and geologic interpretations for a variety of geologic provinces. Course conducted off-campus in a field camp for six weeks. Prerequisites: GEOL 302, 306, 309, 312, or approval of instructor.*
- 306. Sedimentology and Stratigraphy. (3-3). Credit 4.** Origin of sediments and sedimentary rocks; climate, weathering, and weathering products; transport, deposition, and depositional environments for sediments; field and laboratory studies in description and interpretation of genesis of sedimentary rocks; principles of stratigraphy and basin analysis; plate tectonics and formation of sedimentary basins; stratigraphic nomenclature; geologic time and correlation; sequence stratigraphy and basin architecture. Prerequisite: GEOL 101 or 104 or approval of instructor.*
- 312. Structural Geology and Tectonics. (3-3). Credit 4.** Interpretation of rock structures; their relation to stratigraphic, physiographic, and economic problems; regional tectonics of several selected areas. Prerequisites: GEOL 101, 104, or 320; approval of instructor.*
- 330. Geologic Field Trips. Credit 1 to 3.** Field trips to observe, analyze, and interpret the geology and geophysics of selected localities; complements classroom experience. Trip frequencies, duration, dates, and study localities vary with semester. Prerequisite: GEOL 101 or 104 or approval of instructor. May be repeated for credit.*
- 404. Geology of Petroleum. (2-3). Credit 3.** Origin, migration, and accumulation of petroleum; typical U.S. oil and gas fields; laboratory work in subsurface geology. Prerequisites: GEOL 312; senior classification in geology. Note: At Texas A&M at Qatar, the prerequisite for this course is GEOL 104.
- 485. Directed Studies. Credit 1 or more each semester.** Advanced problems in geology.
- 489. Special Topics. Credit 1 to 4.** Selected topics in an identified area of geology. May be repeated for credit. Prerequisite: Approval of instructor.

*Field trips may be required for which departmental fees may be assessed to cover costs.

Geophysics (GEOP)

- 421. Petroleum Seismology I. (3-3). Credit 4.** Physical principles behind seismic acquisition; acoustic/elastic, homogeneous/heterogeneous, onshore/offshore transition zones; description of seismic data, pre- and post-critical reflections, multiples, ground roll; signal processing for seismic data analysis; Fourier transforms, wavelet transform, correlation and smoothness; least squares optimization; forward and inverse problems fitting a Fourier series, deconvolution. Prerequisites: MATH 151 and 152 or approval of instructor.
- 470. Computational Geophysics. (3-0). Credit 3.** Techniques used in the study of geophysical processes, including heat and chemical transport in the Earth, rock deformation and viscous fluid flow; development of conservation laws, relevant boundary conditions and analytical solutions; introduction to numerical solutions. Prerequisites: GEOL 101 or GEOL 104; MATH 308; or approval of instructor.

- 491. Research. Credit 1 to 4.** Research conducted under the direction of faculty member in mechanical engineering. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. Prerequisites: Junior or senior classification and approval of instructor.

Music (MUSC)

- 324. Music in World Cultures. (3-0). Credit 3.** Examination of music from an ethnomusicological perspective focusing on musical performance and the complex interrelationship of music to culture, society and daily life; examination of music from a variety of cultures through a series of case studies. Prerequisite: Junior or senior classification or approval of instructor.

Petroleum Engineering (PETE)

Professors M. A. Aggour, V. C. Kelessidis (PC); **Associate Professors** S. G. Aljuhani, M. Amani, M. Fraim; **Visiting Associate Professor** A. Retnanto

- 201. Introduction to Petroleum Engineering. (1-0). Credit 1.** Overview and history of the petroleum industry and petroleum engineering; nature of oil and gas reservoirs, exploration and drilling, formation evaluation, well completions and production, surface facilities, reservoir mechanics, improved oil recovery; impact of ethical, societal, environmental considerations; career development resources, including professional society. Prerequisite: Approval of department head.
- 225. Introduction to Drilling Systems. (2-3). Credit 3.** 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 112, MATH 152, PHYS 218.
- 285. Directed Studies. Credit 1 to 4.** Special problems in various areas of petroleum engineering assigned to individual students or to groups. Prerequisites: Completion of engineering Common Body of Knowledge courses; approval of department head.
- 289. Special Topics in... Credit 1 to 4.** Selected topics in an identified area of petroleum engineering. May be repeated for credit. Prerequisite: Approval of instructor.
- 300. Summer Practice. Required. No Credit.** Industry practice to familiarize the petroleum engineering student with practices and equipment of the petroleum industry. Approval of advisor required.
- 301. Petroleum Engineering Numerical Methods. (2-3). Credit 3.** Use of numerical methods in a variety of petroleum engineering problems; numerical differentiation and integration; root finding; numerical solution of differential equations; curve fitting and interpolation; computer applications; introduction to the principles of numerical simulation methods. Prerequisites: MATH 308, junior or senior classification, petroleum engineering majors only; or approval of instructor.
- 310. Reservoir Fluids. (3-3). Credit 4.** Thermodynamic behavior of naturally occurring hydrocarbon mixtures; evaluation and correlation of physical properties of petroleum reservoir fluids including laboratory and empirical methods. Prerequisites: CHEM 107, MATH 251, MEEN 315, PETE 311. Corequisite: MATH 308.
- 311. Reservoir Petrophysics. (3-3). Credit 4.** Systematic theoretical and laboratory study of physical properties of petroleum reservoir rocks; lithology, porosity, elastic properties, strength, acoustic properties, electrical properties, relative and effective permeability, fluid saturations, capillary characteristics and rock-fluid interactions such as adsorption and absorption. Prerequisites: MATH 251, PHYS 218. Corequisite: GEOL 104.
- 314. Transport Processes in Petroleum Production. (3-0). Credit 3.** Basics and applications of fluid mechanics (statics; mass, energy, momentum balances; laminar and turbulent flow, Reynolds number, Moody diagram; non-Newtonian fluid flow; multi-phase flow; flow in porous media, non-Darcy flow); heat transfer (heat conduction, convection, heat exchangers); emphasis on analogies and similarities within mass, energy and momentum transport. Prerequisites: MEEN 315, junior or senior classification, petroleum engineering majors only; or approval of instructor.

- 321. Formation Evaluation. (3-3). Credit 4.** 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. Prerequisites: PETE 301, PETE 310, PETE 311; GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.
- 322. Geostatistics. (3-0). Credit 3.** Introduction to geostatistics; basic concepts in probability and univariate statistics; bivariate statistics and spatial relationship; covariance and correlation; second order stationarity; variogram estimation and modeling; spatial estimation and reservoir modeling; simple and ordinary kriging; uncertainty analysis; estimation versus conditional simulation; sequential Gaussian simulation. Prerequisites: Senior classification, petroleum engineering majors only; or approval of instructor.
- 323. Fundamentals of Reservoir Engineering. (3-0). Credit 3.** Determination of reserves; material balance methods; aquifer models; fractional flow and frontal advance; displacement, pattern and vertical sweep efficiencies in waterfloods; enhanced oil recovery processes; design of optimal recovery processes; introduction and performance analysis of unconventional reservoirs. Prerequisites: PETE 301, PETE 310, PETE 311; GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.
- 324. Well Testing. (3-0). Credit 3.** Analysis of well performance under varied reservoir conditions including evaluation of unsteady, pseudo-steady and steady state flow; well testing methods used to determine well and reservoir parameters; applications to conventional and unconventional wells producing gas and/or liquids; fundamentals of preparing and operating well test equipment to monitor, measure and gather samples for evaluating well performance. Prerequisites: PETE 301, PETE 310, PETE 311; GEOL 404, junior or senior classification, petroleum engineering majors only; or approval of instructor.
- 325. Petroleum Production Systems. (2-3). Credit 3.** Petroleum operation and oil field equipment including onshore and offshore production systems; wellbore inflow and outflow and backpressure analysis; down-hole completion and sand control equipment; artificial lift equipment and design; stimulation, workover/completion nomenclature; flow assurance; produced fluids, fluid separation and metering, safety systems, pressure boosting and monitoring. Prerequisites: PETE 301, PETE 310, PETE 314, junior or senior classification, petroleum engineering majors only; or approval of instructor.
- 336. Petroleum Technical Presentations I. (0-3). Credits 1.** Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format; oral presentations judged by petroleum industry professionals. Prerequisite: ENGL 210; junior or senior classification, petroleum engineering majors only; or approval of department head.
- 335. Petroleum Project Evaluation. (3-0). Credit 3.** Economic analysis and investment decision methods in petroleum and mineral extraction industries; depletion, petroleum taxation regulations, and projects of the type found in the industry; mineral project evaluation case studies. Corequisites: PETE 301, PETE 310.
- 355. Drilling Engineering. (3-0). Credit 3.** Design and evaluation of well drilling systems; identification and solution of drilling problems; wellbore hydraulics, well control, casing design; well cementing directional drilling, offshore drilling. Prerequisites: PETE 225, PETE 314; Corequisites: PETE 321, PETE 325.
- 401. Reservoir Simulation. (1-3). Credit 2.** Solution of production and reservoir engineering problems using state-of-the-art commercial reservoir simulation software, using data commonly available in industry; emphasis on reservoir description, reservoir model design and calibration, production forecasting and optimization, economic analysis and decision making under uncertainty. Prerequisites: PETE 310, PETE 321, PETE 323, PETE 324.
- 402. Integrated Asset Development. (1-6). Credit 3.** Capstone design encompassing previously acquired skills; project teams formed to solve practical petroleum engineering problems using current tools; technical content of the projects may include any combination of drilling and completion, formation evaluation, inflow/outflow design and analysis, and application of reservoir engineering principles. Prerequisites: PETE 355, PETE 404, PETE 410.

- 404. Integrated Reservoir Modeling. (3-0). Credit 3.** Geophysical, geological, petrophysical and engineering data with geostatistical methods to create reservoir descriptions for dynamic reservoir modeling (simulation); geostatistical concepts such as variogram modeling, kriging and sequential Gaussian simulation; combines several techniques to quantify uncertainty in a realistic dynamic reservoir simulation. Corequisite: PETE 401.
- 406. High Performance Drilling Design and Operational Practices. (3-0). Credit 3.** Preparation in achieving differentiating drilling performance in the most complex wells; includes training in the underlying physics of each type of performance limiter and real-time and engineering practices to address the limitation; performance management workflows and change models required to effectively change the way organizations conduct work essential in achieving higher performance. Prerequisite: PETE 355.
- 410. Production Engineering. (3-0). Credit 3.** Fundamental production engineering design, evaluation and optimization for oil and gas producing well; well deliverability; formation damage and skin analysis; well completion selection; technologies that improve oil and gas well performance including artificial lift and well stimulation. Prerequisites: PETE 321, PETE 323, PETE 324, PETE 325.
- 412. Surface Production Facilities. (3-0). Credits 3.** Overview of separation and treatment of production fluid; fundamentals of gas-liquid separation; design and performance analysis of two- and three-phase separators; oil desalting, sweetening and stabilization; water treatment; overview of gas separation, dehydration and sweetening. Prerequisite: Senior classification and approval of instructor.
- 416. Solving Common Production Engineering Problems. (3-0). Credit 3.** Application of petroleum engineering tools, methods and techniques to solve real problems that petroleum engineers encounter in producing individual wells; focus primarily on problems associated with single-phase gas wells and uses Microsoft Excel to solve many of these problems. Prerequisite: PETE 410.
- 436. Petroleum Technical Presentations II. (0-3). Credits 1.** Preparation of a written technical paper on a subject related to petroleum technology and an oral presentation of the paper in a formal technical conference format; oral presentations judged by petroleum industry professionals at the departmental student paper contest held during the same academic year. Prerequisite: PETE 336; senior classification, petroleum engineering majors only; or approval of department head.
- 458. Energy and Sustainability. (3-0). Credit 3.** 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.
- 485. Directed Studies. Credit 1 to 5.** Special problems in various phases of petroleum engineering assigned to individual students or to groups. Prerequisites: Junior or senior classification and approval of department head.
- 489. Special Topics in... Credit 1 to 4.** Selected topics in an identified field of petroleum engineering. Approval of instructor. May be repeated for credit.