<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Prerequisites</th>
<th>Lecture + Lab + Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>PETE F101</td>
<td>Fundamentals of Petroleum, Drilling and Production</td>
<td>3</td>
<td>Fall and Spring</td>
<td>Fundamental principles of origin, migration, accumulation and exploration of petroleum. Principles of drilling, drilling practices, and drilling fluids. Overview of production practices, surface production equipment. Influence of rock and fluid properties on the principles of petroleum recovery, petroleum transportation. Overview of Alaska unconventional hydrocarbon resources, opportunities and impact on the state economy.</td>
<td>3 + 0 + 0</td>
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<tr>
<td>PETE F301</td>
<td>Reservoir Rock and Fluid Properties</td>
<td>4</td>
<td>Fall</td>
<td>Fundamental concepts of reservoir rock and fluid properties including porosity, permeability, fluid saturations, capillary pressure, relative permeabilities, classification of petroleum reservoirs by fluid phase contents, oil, gas and water properties, fluid sampling, and PVT analysis.</td>
<td>4 + 0 + 0</td>
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<tr>
<td>PETE F302</td>
<td>Well Logging</td>
<td>3</td>
<td>Spring</td>
<td>Comprehensive treatment of modern well logging methods including formation and production logging tools, and techniques and basic concepts of open hole log interpretation.</td>
<td>3 + 0 + 0</td>
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<tr>
<td>PETE F303</td>
<td>Reservoir Rock and Fluid Properties Laboratory</td>
<td>1</td>
<td>Spring</td>
<td>Measurement of properties of reservoir rock and reservoir fluids. Determination of porosity, permeability, fluid saturations, capillary pressures, specific gravity density, viscosity, surface tension, PVT properties and interpretation of PVT reports for reservoir fluid samples.</td>
<td>0 + 3 + 0</td>
</tr>
<tr>
<td>PETE F370</td>
<td>Sedimentology and Structural Geology for Petroleum Engineers</td>
<td>4</td>
<td>Odd-numbered Years</td>
<td>Origin and distribution of sedimentary rocks including depositional environments, stratigraphic relationships and structures. Emphasis on the relationship to petroleum occurrences and petroleum exploration. Laboratory exercises on mapping, structural problems and facies relationships in petroleum exploration.</td>
<td>3 + 3 + 0</td>
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<tr>
<td>PETE F407</td>
<td>Petroleum Production Engineering</td>
<td>3</td>
<td>Fall</td>
<td>Production system analysis, inflow performance analysis, gas lift design, sucker rod pumping and production decline analysis.</td>
<td>3 + 0 + 0</td>
</tr>
<tr>
<td>PETE F411</td>
<td>Drilling Fluids Laboratory</td>
<td>1</td>
<td>Spring</td>
<td>Design, composition and measurement of drilling fluid properties, evaluation of mud activities and chemical treatment of contaminated drilling fluid.</td>
<td>0 + 3 + 0</td>
</tr>
<tr>
<td>PETE F421</td>
<td>Reservoir Characterization</td>
<td>3</td>
<td>Spring</td>
<td>Reservoir rock properties and their spatial variations; estimation of reserves; introduction to theory and application of geostatistics to reservoir characterization; presentation of fundamental geostatistical concepts including: variogram analysis, estimation variance, kriging and stochastic simulations. Impact of geologic structure on oil recovery methods.</td>
<td>3 + 0 + 0</td>
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<tr>
<td>PETE F426</td>
<td>Drilling Engineering</td>
<td>3</td>
<td>Spring</td>
<td>Principles of drilling, drilling fluids and rheology, drilling problems, drilling hydraulics, well control techniques and casing seat selection.</td>
<td>3 + 0 + 0</td>
</tr>
<tr>
<td>PETE F431</td>
<td>Natural Gas Engineering</td>
<td>2</td>
<td>Spring</td>
<td>Natural gas production and condensate reservoirs. Design of processing, transportation, distribution and flow measurement systems.</td>
<td>2 + 0 + 0</td>
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<tr>
<td>PETE F456</td>
<td>Petroleum Evaluation and Economic Decisions</td>
<td>3</td>
<td>Spring</td>
<td>Economic appraisal methods for oil field developmental project evaluations including risk analysis, probability and statistics in decision making and evaluations. Case studies.</td>
<td>3 + 0 + 0</td>
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PETE F458  Petroleum Engineering Internship  
1 Credit
Offered As Demand Warrants
Practical experience in a supervised petroleum engineering environment. Participation in professional petroleum operations including drilling, production, formation evaluation, reservoir engineering, petroleum property evaluation, management and economics. Written and oral presentation of technical report describing experience is required. Course may be repeated for up to 4 credits.
Prerequisites: Junior standing or permission of instructor.
Lecture + Lab + Other: 0 + 0 + 0

PETE F466  Petroleum Recovery Methods  
3 Credits
Offered Fall
Flow and physicochemical principles of oil recovery by water, chemical, thermal and miscible floods. Prediction of recovery for each of these methods.
Prerequisites: PETE F301 and PETE F476.
Lecture + Lab + Other: 3 + 0 + 0

PETE F476  Petroleum Reservoir Engineering  
3 Credits
Offered Spring
Quantitative study and prediction of the behavior of oil and gas reservoirs under primary, secondary and tertiary recovery mechanisms.
Prerequisites: PETE F301; MATH F253X.
Lecture + Lab + Other: 3 + 0 + 0

PETE F478  Well Test Analysis  
2 Credits
Offered Spring
Transient flow of fluids through porous media, application of solutions of the diffusivity equation to pressure buildup, drawdown, interference testing and log-log type curve analysis and effect of reservoir heterogeneities on pressure behavior.
Prerequisites: PETE F407; PETE F476; MATH F302.
Lecture + Lab + Other: 2 + 0 + 0

PETE F481  Well Completions and Stimulation Design (W)  
3 Credits
Offered Fall
Design of casing programs, cementing, open-hole and set-through completions, well stimulation; completion and workover fluids; and evaluation of sand control and workover operations.
Prerequisites: WRTG F111X; WRTG F211X or WRTG F213X; ES F341; PETE F426; or permission of instructor.
Lecture + Lab + Other: 2 + 3 + 0

PETE F487  Petroleum Project Design  
2 Credits
Emphasis on design and analysis of petroleum exploration, production and reservoir engineering systems by analytical, experimental and computer methods. Identification of requirements, conceptual and detailed project design and cost analysis. Completion of an engineering project.
Prerequisites: COJO F131X or COJO F141X; WRTG F111X; WRTG F211X or WRTG F213X; senior standing.
Lecture + Lab + Other: 2 + 0 + 0

PETE F487A  Petroleum Project Design  
1 Credit
Offered Fall
Two-semester course with emphasis on design and analysis of petroleum exploration, production and reservoir engineering systems by analytical, experimental and computer methods. Identification of requirements, conceptual and detailed project design and cost analysis. Completion of an engineering project.
Prerequisites: Senior standing; PETE F407 or PETE F426; PETE F476.
Lecture + Lab + Other: 2 + 0 + 0

PETE F487B  Petroleum Project Design (0, W)  
1 Credit
Offered Spring
Two-semester course with emphasis on design and analysis of petroleum exploration, production and reservoir engineering systems by analytical, experimental and computer methods. Identification of requirements, conceptual and detailed project design and cost analysis. Completion of an engineering project.
Prerequisites: COJO F131X or COJO F141X; WRTG F111X; WRTG F211X or WRTG F213X; senior standing; or permission of instructor.
Lecture + Lab + Other: 2 + 0 + 0
PETE F621 Applied Reservoir Characterization
3 Credits
Offered As Demand Warrants
Review of reservoir rock properties and their spatial variations; estimation of reserves; introduction to theory and application of geostatistics to reservoir characterization; presentation of fundamental geostatistical concepts including: variogram analysis, estimation variance, kriging and stochastic simulations. Impact of geologic structure on oil recovery. Use of computer software for reservoir characterization and class project.
Prerequisites: Graduate standing in Petroleum Engineering; or permission of instructor.
Stacked with PETE F421.
Lecture + Lab + Other: 3 + 0 + 0

PETE F630 Waterflooding
3 Credits
Offered As Demand Warrants
A study of the fundamental concepts and procedures for the design of waterflooding processes in petroleum reservoirs.
Prerequisites: PETE F301; PETE F476; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F645 Petroleum Geology
3 Credits
Offered Alternate Fall Even-numbered Years
Examines the origin of petroleum, the geologic controls on its distribution and accumulation and the basic tools used for exploration and exploitation, including subsurface mapping, well logging, and exploration geophysics.
Prerequisites: Graduate standing or permission of the instructor.
Cross-listed with GEOS F645.
Lecture + Lab + Other: 3 + 0 + 0

PETE F656 Advanced Petroleum Economic Analysis
3 Credits
Offered As Demand Warrants
Economic analysis of petroleum production leading towards increasing cost efficiency in the petroleum and related industries. Qualitative and quantitative description of production forecasts and reserve estimation; oil and gas pricing; cash flow analysis; risk and uncertainty of operation of oil and gas production (financing, debt/equity ratio, depreciation and taxation).
Prerequisites: PETE F407, PETE F456; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F661 Applied Well Testing
3 Credits
Offered As Demand Warrants
Equations for transient flow of single phase fluids through porous media, extension to sample multiphase flow, isolated and developed multi-well flow, conventional drawdown and buildup analysis, log-log type curve analysis, interference testing, fractured wells, pulse tests, and drill stem tests.
Prerequisites: PETE F476; PETE F610; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F662 Enhanced Oil Recovery
3 Credits
Offered As Demand Warrants
Secondary and tertiary oil recovery processes, including waterflooding and chemical and thermal recovery methods.
Prerequisites: PETE F476 or PETE F610 or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F663 Applied Reservoir Simulation
3 Credits
Offered As Demand Warrants
Mathematical description of the reservoir, organization of reservoir simulation study, history matching and prediction for several published case studies of reservoir simulations.g. PETE F476 or PETE F610, or permission of instructor.
Prerequisites: Reservoir Engineering course, e.
Lecture + Lab + Other: 3 + 0 + 0

PETE F665 Advanced Phase Behavior
3 Credits
Offered As Demand Warrants
The development and application of phase equilibrium simulators to predict fluid properties for reservoir fluids.
Prerequisites: PETE F301 or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F666 Drilling Optimization
3 Credits
Offered As Demand Warrants
Principles of drilling optimization: drilling cost analysis and control; rheological properties of drilling fluid for optimum hole cleaning; planning an optimum mud program for vertical, directional and horizontal wellbores; optimizing bit hydraulics. Use of software packages in optimized hydraulics.
Prerequisites: Graduate standing in engineering discipline or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F670 Fluid Flow Through Porous Media
3 Credits
Offered As Demand Warrants
The study of transport phenomena in porous media and application to petroleum engineering.
Prerequisites: PETE F301; PETE F476; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F680 Horizontal Well Technology
3 Credits
Offered As Demand Warrants
Review of the state of the art of horizontal well technology covering recent advances in drilling and completion of horizontal wells. Emphasis on field practices, reservoir engineering aspects including well testing and well performance estimation, application of horizontal wells to gas and water coning problems as well as enhanced oil recovery.
Prerequisites: PETE F426; PETE F476; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F683 Natural Gas Processing and Engineering
3 Credits
Offered As Demand Warrants
Natural gas reservoir engineering and gas production practices. Transient flow of real gases, gas field development, gas well testing, transportation and gas storage reservoirs.
Prerequisites: PETE F431; PETE F476; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0
PETE F685  Non-Newtonian Fluid Mechanics
3 Credits
Offered As Demand Warrants
Characteristics of stress in fluids, flow models of non-Newtonian fluids (Bingham plastic fluids, fluids without yield stress), couette flow analysis of non-Newtonian fluids, surge and swab pressure models for plugged and open-end pipes.

Prerequisites: ES F341; PETE F426 or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F687  Experimental and Data Analysis Methods in Petroleum Engineering
3 Credits
Offered As Demand Warrants
Application of statistical methods to develop empirical models in petroleum engineering. Topics covered included dimensional analysis, fundamental statistical concepts, regression analysis, neural networks, time series analysis and analysis of factorial and fractional factorial designed experiments.

Prerequisites: Graduate standing; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F689  Multiphase Fluid Flow in Pipes
3 Credits
Offered As Demand Warrants
Multiphase flow in pipes, modeling of fluid flow of complex mixtures in pipes, empirical correlations developed in the literature, and calculation of pressure gradients and flow rates during the flow of multiphase fluids through vertical, inclined and horizontal pipes.

Prerequisites: ES F341; MATH F310 or ES F301; PETE F407; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

PETE F692  Seminar
1-3 Credits
Lecture + Lab + Other: 0 + 0 + 0

PETE F692P  Seminar
1-3 Credits
Lecture + Lab + Other: 0 + 0 + 0

PETE F698  Non-Thesis Research/Project
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0

PETE F699  Thesis
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0