Energy Resource Engineering (ERE)

College of Engineering and Mines
Department of Petroleum Engineering (https://www.uaf.edu/cem/programs/petroleum-engineering/)
907-474-7734

ERE F101 Introduction to Energy Resource Engineering
3 Credits
Offered Spring
Design, evaluation and implementation of conventional and alternative energy systems for heat and electric power applications. Focuses on developing the basic skills in approaching engineering problems and applying them towards the energy industry. Students will learn about the engineering skills required in mining, petroleum and renewable energy.
Prerequisites: (MATH F151X and MATH F152X) or MATH F156X (may be taken concurrently) or ES/MATH F186 (may be taken concurrently) or placement into MATH F251X.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F301 Petroleum and Geothermal Reservoir Rock and Fluid Properties
3 Credits
Offered Fall
Overview of sedimentary, hot and igneous rocks including depositional environments. Rock and fluid properties including porosity, permeability, fluid saturations, capillary pressure, classification of reservoirs fluids, phase behavior of hydrocarbons, thermodynamics of steam and water, PVT analysis. Laboratory exercises on identification of energy bearing rocks, properties of hydrocarbons, steam, hot water.
Prerequisites: ES F346 (may be taken concurrently); MATH F252X.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F303 Electric Power Systems and Machines
4 Credits
Offered Fall
Introduction to electromechanical energy conversion principles, phasors and complex power, characteristics and applications of power transformers, network equations, synchronous machines, induction machines, DC machines, symmetrical components and sequence networks.
Prerequisites: EE F203 or ES F307.
Cross-listed with EE F303.
Lecture + Lab + Other: 3 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F407 Petroleum and Geothermal Production Engineering
3 Credits
Offered Fall
Inflow and outflow performance. Single and multi-phase flow in wellbores. Design and analysis of production systems for oil, gas and geothermal reservoirs, artificial lift. Decline curve analysis. Surface processing of produced oil and gas. Geothermal plants.
Prerequisites: ERE F476; ES F341; ES F346.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F409 Renewable and Sustainable Energy Systems
3 Credits
Offered Spring
Study of renewable energy systems focusing on grid integration of wind turbine generators, solar photovoltaics, geothermal, biomass, hydroelectric, hydrokinetics, and energy storage. Design and analysis for efficient, sustainable, reliable, and resilient grid operation with distributed renewable energy sources considering cogeneration, controls optimization, economic dispatch, emissions, interruptible loads, and waste-heat recovery.
Prerequisites: EE F303 or ERE F303.
Cross-listed with EE F409.
Stacked with EE F609.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F426 Energy Drilling Engineering
3 Credits
Offered Spring
Introduces a working knowledge of drilling engineering, using fundamental drilling engineering principles for drilling design, and evaluating drilling operations based on drilling engineering concepts. The course covers both conventional and geothermal well drilling.
Prerequisites: ES F331; ES F341.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F444 Data Analysis and Modeling for Energy Engineers
3 Credits
Offered Spring
Introduction to data analytics for energy resources; probability distributions; data collection methods; inferential statistics; least squares; optimization methods; clustering; regression and stochastic timeseries data modeling; Inverse methods; and risk analysis.
Prerequisites: ES F201; MATH F302; STAT F300.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F458 Energy and the Environment
3 Credits
Offered Fall
Overview of basic concepts of energy supply, demand, production of heat and power impacts of energy use on the environment. Extensive discussion of mitigation technologies and strategies for meeting energy needs while preserving environmental quality.
Prerequisites: CHEM F106X; ES F346 or equivalent; MATH F252X; PHYS F211X.
Cross-listed with ME F458.
Stacked with ERE F658; ME F658.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F469 Carbon Capture, Utilization and Sequestration
3 Credits
Offered Spring
This course introduces carbon capture technologies, CO2 conversion and sequestration technologies. Technical foundations on the carbon cycle, thermodynamics, transport, absorption, sequestration, process control, mineralization and conversion. Analysis of cases in the technology, policy and regulatory framework context.
Prerequisites: ERE F476 (may be taken concurrently).
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F476 Petroleum and Geothermal Reservoir Engineering
3 Credits
Offered Spring
Similarities and differences in petroleum and geothermal reservoirs. Fluid/heat flow in porous media. Quantitative study and prediction of the behavior of oil and gas reservoirs under primary, secondary and tertiary recovery mechanisms. Thermal reserves of geothermal systems. Well test analysis to determine petroleum and geothermal reservoir characteristics.
Prerequisites: ERE F301; ES F346; MATH F253X.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F486 Energy Resources Economics
3 Credits
Offered Spring
Economic appraisal methods for evaluating energy resource development projects, including risk analysis, probability and statistics in decision-making and evaluations. Case studies. Economics of carbon capture, utilization and storage (CCUS).
Prerequisites: MATH F253X; STAT F300.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F490 Energy Resource Engineering Design I
1 Credit
Offered Fall
Team-oriented design project with emphasis on practical energy resource engineering systems and components, which integrates engineering knowledge and skills that students have acquired. Design process principles, including project management, economics and ethics, will be introduced in the lecture. Each design team will generate and present a proposal for their design.
Prerequisites: COM F121X, COM F131X or COM F141X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; ERE F426; ERE F469.
Lecture + Lab + Other: 1 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F491 Energy Resource Engineering Design II
3 Credits
Offered Spring
Design teams will continue to work towards completing their proposed design from the first semester using engineering design process techniques. Each design team will follow a design schedule to complete a simulation and/or prototype, including weekly meetings and progress reports, ending with a final design report and public presentation.
Prerequisites: ERE F490.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

ERE F658 Energy and the Environment
3 Credits
Offered Fall
Overview of basic concepts of energy supply, demand, production of heat and power impacts of energy use on the environment. Extensive discussion of mitigation technologies and strategies for meeting energy needs while preserving environmental quality.
Recommended: CHEM F106X; ES F346; MATH F252X; PHYS F211X; graduate standing.
Cross-listed with ME F658.
Stacked with ERE F458; ME F458.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus