General information

Today, in scope with the world's gradually increasing demand for oil and gas sectors, we are at the forefront in petroleum education and technology. The high demand for petroleum engineers in the sector of oil and gas production is projected to remain well in the 21st century.

Petroleum and natural gas engineering is a broad-based discipline concerned with the development, exploration, transportation and storage of oil and gas resources. Petroleum and natural gas engineers plan and supervise drilling and well-completion programs, design and select drilling and production equipment, design pipelines for oil and gas transportation, storage, estimate reserves, and manage oil and gas properties.

Profesional accreditation:

Petroleum and Natural Gas Engineering is accredited by European Accreditation Agency (**ASIIN**).

Program Objective:

- To assist graduate students in developing skills for scientific research
- To help graduate students develop leadership skills necessary for managing engineering projects
- To provide graduate students skills for development of solutions to Petroleum and Natural Gas Engineering problems.

Learning outcomes of the Master's degree program:

- Apply knowledge of mathematics and related science to diagnose and solve petroleum engineering problems
- Master the techniques, skills, and modern engineering tools in petroleum engineering
- Design and conduct experiments, analyze and interpret data
- Design a system, component, or process to meet desired needs within realistic constraints such as industrial, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- Develop ability to work in multidisciplinary teams
- Formulate, and solve petroleum engineering problems
- Understanding of professional and ethical responsibility
- Ability to communicate effectively

Graduation Requirements:
Final examinations of graduate courses will be assessed over 100 (one hundred) full points by the faculty member(s) carrying out the exam. In order to pass the final exam, master's students must earn a minimum score of 70 (seventy) out of 100 (one hundred) points.

Cumulative grade point average must be 80 (eighty) over 100 (one hundred) or 3.00 (three) over 4.00 (four) to earn a master's or doctoral degree.

Master's Program With Thesis:

The aim of the master's program with thesis is to enable students to acquire the ability to conduct scientific research leading to the acquisition, evaluation and interpretation of knowledge. A master's program with thesis is comprised of a minimum of seven courses, not being less than 21 credits, one seminar course, other educational activities and thesis study. The seminar course and thesis study are compulsory. Students may also take courses from other institutions of higher education upon the recommendation of the Department Chairperson and approval of the Graduate School Administrative Board.

Master's Degree Diploma:

A student who has passed the thesis examination, completed all other requirements, and submitted at least four bound copies of the thesis to the Graduate School within one month after taking the thesis examination will be conferred the Master's Degree Diploma on condition that the thesis meets the format requirements. The Master‟s Degree Diploma will bear the official name of the program completed and the title Master of Science awarded.

MODULES

Core Modules:

PGE 500 Master's Thesis: 3 Credits, 10 ECTS

PGE Master's Seminar: 3 credits, 10 ECTS

Elective Modules: *7 elective courses to be chosen to complete the program

PGE 503 Advanced Reservoir Engineering

Error analysis. Definition of reservoir parameters. Averaging techniques for reservoir pressure, porosity, permeability. Flow of fluids through the reservoir: Concept of unsteady, pseudosteady and steady state flow. Approximate equations in fluid flow problems. Oil well pressure performance. Diffusivity equation and its solution, application to two- and multi-well problems. Injection rate for depleted and liquid-filled reservoirs.

PGE 505Advanced Natural Gas Engineering

Physical and thermodynamic properties, phase behavior, and vapor-liquid equilibria of dry, wet and retrograde natural gas systems. Natural gas sampling methods. Natural gas hydrates. Selection of gas compressors. Bottom hole pressure estimation and liquid loading of deep gas wells in flowing or shut-in condition. Flow of gases in reservoirs. Types and analyses of testing and decline curves for gas wells.

PGE 509 Hydrocarbon Thermodynamics

General phase behavior od petroleum and natural gas systems; First and second laws of thermodynamics; Thermodynamic processes; Mass and energy balance for open systems; PVT behavior of pure components; Corresponding states law; Equations of state; Vapor pressure, z-factor for hydrocarbon gases, enthalpy, entropy and heat capacity correlations; Property relations for homogeneous phases; Residual properties; Joule-Thomson effect; Simple models for VLE; Property relations for mixtures, chemical potential and phase equilibrium, partial properties; Definition of fugacity and fugacity coefficient; Models for ideal mixtures; Modeling of vapor-liquid equilibrium; CCE, CVD and differential vaporization processes.

PGE 511 Advanced Drilling Engneering

An advanced study of drilling hydraulics including rheological models. Computer modeling of various flow related problems in drilling operations and a review of Measurement While Drilling technology. Underbalanced drilling techniques and applications. A review of deepwater drilling hydraulics. Predictions and verification of formation pore pressure. Predictions and verification of formation fracture resistance. Horizontal and directional drilling.

PGE 515 Advanced Production Engineering

Phase behavior of hydrocarbons fluids and fluid physical properties; Inflow performance relationships of saturated, unsaturated, and stratified reservoirs; Inflow performance of horizontal and deviated wells; Production optimization with nodal system analysis; Multiphase flow in production systems and flow correlations; Decline curve analysis; Surface separation of oil and gas.

PGE 501 Special Topics in Petroleum Engineering

Selected topics on petroleum, natural gas, and geothermal energy will be discussed at graduate level; The content of the course will be determined by the instructor. Contemporary research advanced engineering, economics and legal subjects in petroleum, natural gas, and geothermal energy areas are possible topics for this course.

PGE 517 Petrophysics

Concepts, theories, laboratory and field measurement methods for the properties of porous and permeable rocks, i.e. porosity, surface area and roughness, particle and pore size distribution, compressibility, electric, acoustic, mechanic, magnetic, radioactive, etc, and for their interactions in wettability, interface, capillarity, imbibition, permeability, and flow with the gases, hydrocarbon liquids, and aqueous solutions they contain.

PGE 502 Geothermal Reservoir Engineering

Geothermal energy in Turkey and in the world. Introduction to geothermal reservoir engineering. Thermodynamics and phase behavior. Classification of reservoirs based on the types of fluid contents and phase properties. Estimation of recoverable energy from reservoirs. Calculating wellbore temperatures, pressures and enthalpies in production and injection wells. Reinjection. Modeling the field production performance. Renewability and sustainability for geothermal fields.

PGEE 504 Advanced Well Test Analysis

Fundamentals of well testing and analysis; Injection/falloff, drawdown/buildup tests; Derivations of flow equations describing unsteady flow of fluids (single, multi-phase fluid flow) in porous media; Solutions of diffusivity equations with different initial and boundary conditions; Interference testing; Modelling of wellbore storage and skin effects; Conventional analysis techniques (manual type-curve matching and straight line methods); Modern analysis techniques (pressure-derivative and pressure-integral methods, computer aided automated type-curve matching); Superposition in space and time (modelling interference effects between wells, boundary and variable flow rate effects); Flow regimes observed in vertical wells producing in infinite and bounded homogeneous systems; Convolution and Deconvolution; Well test analysis in gas wells; Drill stem testing (DST); An overview of pressure transient analyses in complex well/reservoir systems (horizontal wells, naturally fractured reservoirs).

PGE 506 Advanced Well Log Analysis

Information on rock composition, texture and diagenesis. Rock physics and pore-space properties. Magnetic, radioactive, elastic, acoustic, thermal, electrical properties of rocks. Conventional and reconnaissance interpretation techniques. Crossplotting techniques. Interpretation in complex lithologies. Interpretation in shaly formations. Evaluation of gas-bearing formations. The cased-hole logging job and formation evaluation. Well integrity and cement evaluation surveys. Fluid movement logs and evaluation.

PGE 528 Phase Behavior of Petroleum Fluids

Classification of petroleum and natural gas related hydrocarbons; Classification of petroleum reservoir fluids based on their phase behavior characteristics; Production characteristics of petroleum and natural gas; Empirical physical property correlations; Compositional analysis of petroleum and natural gas; Phase equilibrium in vapor-liquid hydrocarbon systems; Fluid phase equilibria using equation of state; Characterization of petroleum and natural gas fluids; Splitting and lumping of heavier ends in petroleum and gas condensates; Experimental methods in PVT measurements; Compositional grading in petroleum reservoirs; Prediction of asphaltene precipitation and wax formation.

PGE 512 Underground Storage of Natural Gas

Current state of natural gas and underground storage facilities in Turkey and in the world. Properties and transportation of natural gas. Reasons for storage in underground. The need for the underground storage in Turkey. Degree-day method for predicting the gas consumption of the residential sector. Surface and underground storage methods. Storage in porous media, aquifers, and salt domes. Design of storage and its modeling. Management of underground storage fields in Turkey. Current research topics on underground storage.

PGE 514 Well Completion Design

Well completion operations in oil, gas and jeothermal wells. In this course open hole and cased hole completions with all cementing operations casing, balane, repair, squeeze cementing operations and techniques are explained. In addition, secondary recovery injection well completions such as gas, water, CO_2 injection and disposal wells completion preperations are thought. Cement Slurry prepertion, techniques, chemicals, cement tests are explained. Well stimulation, acidizing such as HF, HCl, mud acid operations are the fundementals of the course.