

Brief description of master of science courses in petroleum engineering

PGE 510 (Theory of Fluid Flow Through Porous Media), 3(3-0-0)

Development of basic equations of fluid flow (Continuity equation, energy equation, and Darcy's law) in Cartesian and polar coordinate systems for single phase and multiphase flow. Diffusivity equation for compressible and incompressible flow. Applications of fluid flow equations to various oil recovery processes. Solutions of the diffusivity equation and applications to transient analysis. Introduction to reservoir simulation.

PGE 512 (Water Flooding), 3(3-0-0)

Buckley-Leverett theory. Well patterns. Sweep efficiency and conformance. Cross flow. Approximate design methods. Surface equipment. Water treatment. Selective plugging and profile control.

PGE 513 (Tertiary Oil Recovery), 3(3-0-0)

Chemical flooding methods, using surfactants, polymer, carbon dioxide, caustic, etc. Theories of oil entrapment and mobilization. Basic equations, theories and models. State-of-the art and field experience. Economics.

PGE 515 (Reservoir Simulator Development), 3(3-0-0)

Finite difference schemes. Time and distance discretization. Stability criteria. Applications to petroleum reservoir flow equations: IMPES and simultaneous solution. Development of multi-dimensional, multi-phase reservoir simulator.

PGE 516 (Advanced Natural Gas Technology), 3(3-0-0)

Phase relations of natural gas systems (ternary diagrams). Mathematical representation of phase behaviour. Gas analysis by spectrometry and chromatography. Design of gas pipelines. Advanced technology of underground storage of natural gas.

PGE 518 (Advanced Well Test Analysis), 3(3-0-0)

The diffusivity equation, line source solution and applications, van Everdingen and Hurst solution, effect of skin and wellbore storage, finite reservoirs and shape factors, use of pressure derivatives in well test analysis, pulse testing, the use of nonlinear regression in well test analysis, well testing in horizontal wells.

PGE 520 (Advanced Oil Well Drilling Engineering), 3(3-0-0)

Drilling problems, blowout control, loss circulation, solids controlled equipment, prediction of fissures and vugs pressure, directional drilling, horizontal drilling, complete well planning, and corrosion problems in drilling engineering.

PGE 521 (Advanced Drilling Fluids Engineering), 3(3-0-0)

Equipment and procedures for evaluating drilling fluids performance, clay mineralogy and colloid chemistry of drilling fluids, rheology of drilling fluids, filtration properties of drilling fluids, surface chemistry of drilling fluids, drilling problems related to drilling fluids, completion, workover and packer fluids.

PGE 530 (Advanced Petroleum Production Engineering), 3(3-0-0)

Inflow performance relationships, reservoir considerations, in well completions, completion and workover fluids, vertical flow by intermittent slugs, problems in well analysis, surface and separation facilities for oil, water and gas, choice of optimal production system.

PGE 531 (Advanced Well Stimulation Technology), 3(3-0-0)

Acidizing and well stimulation. Well diagnosis and workover. Deformations and their effect on well productivity. Fracturing theory and applications.

PGE 532 (Multiphase Fluid Flow in Conduits), 3(3-0-0)

Introduction. Mathematical and physical bases for pressure loss calculations in multiphase flow. Vertical multiphase flow. Horizontal multiphase flow. Multiphase flow in inclined pipes, and in directionally drilled wells.

PGE 541 (Petroleum Exploration), 3(3-0-0)

Land and marine gravity, and land and airborne magnetometer surveys. Interpretation. Modern methods of seismic surveying and of data interpretation. Seismic maps and sections. Remote sensing.

PGE 542 (Reservoir Evaluation), 3(3-0-0)

Elements of evaluation and economic systems governing value. Reservoir tools and their use to determine value. Geological input to evaluation. Principles of risk and uncertainty.

PGE 543 (Advanced Petroleum Economics), 3(3-0-0)

Exhaustible and renewable energy sources, international oil and gas market, oil and gas supply and demand, oil and gas prices, energy modeling and forecasting, competition and switching between fuels, the role of strategic oil inventory, risk analysis and uncertainty.

PGE 544 (Rock Mechanics), 3(3-0-0)

Analysis of stress and infinitesimal strain, Rock mechanical properties, Rock failure criteria, Linear elasticity and deformation, pore fluid pressure and flow in rocks, Laboratory tests, Rock yielding, Effect of effective stress on rock permeability, Physico-chemical analysis of wellbore stability.

PGE 545 (Advanced Topics in Petroleum Engineering), 3(3-0-0)

The department will select a newly developing area in petroleum engineering for offering.

PGE 546 (Graduate Seminar), 1(1-0-0)

Each participating student will attend many seminars offered by the department and oil companies and will present two or three subjects in petroleum engineering and discussion will be initiated from the participating students, faculty members and audience.