Indian Institute of Technology
Course Details Report

Course No: PE5100

Course Name: Petroleum Production Engineering and Flow Assurance

Course Type:

Theory

Description:

This course introduces students to the operations of petroleum production, with a focus on well completion, workover, stimulation, and flow assurance. It aims to build detailed knowledge of well-servicing operations, including the removal of
hydrates, wax, and scales, as well as stimulation techniques such as acidizing and hydraulic fracturing. The course also addresses reservoir-related production challenges and near-wellbore flow problems, integrating both subsurface and
surface-level aspects of petroleum production.
Learning outcomes:

Upon successful completion of this course, students will be able to:

Explain the principles and practices of well completion, workover, and stimulation.

Identify and analyze common production problems in wells and propose appropriate remedial measures.

Design and evaluate stimulation treatments, including acidizing and hydraulic fracturing.

Diagnose and mitigate flow assurance challenges such as hydrate, wax, and scale formation in wellbore and surface systems.

Integrate field data, production performance, and remedial techniques for effective well and production management.

Course Content:

Well Completion and Production Tools: Fundamentals and types of well completions, Completion fluids and perforating technology, Sand control methods, Wellbore equipment: packers, plugs, tubing string design, Flow control devices and safety valves

Well Problems and Production Challenges: Mechanical failures in the wellbore, Completion-associated problems, Water and gas coning, Cementing failures and corrosion issues.

Well Servicing and Workover Operations: Workover rigs and selection criteria, Rig-less operations: slickline, E-line, and coiled tubing techniques, Formation damage and remedial methods, Workover fluids: types, selection, and compatibility.

Well Stimulation — Acidizing and Hydraulic Fracturing: Identification of well problems and stimulation needs, Acid types and acid-rock interaction, Sandstone and carbonate acidizing, Acid volume calculation and job design, Hydraulic fracturing: fracture geometry, fluids, and proppants.

Flow Assurance in Production Systems: Hydrate formation: thermodynamics, inhibition, and remediation, Wax and paraffin deposition: mechanisms, prevention, and removal, Scale formation: types, causes, and mitigation strategies, Integration of flow assurance with well and field operations.

Text Books:

1. Boyun Guo, William C. Lyons, Ali Ghalambor. Petroleum Production Engineering - A Computer Assisted Approach. 2007. Elsevier Science and Technology Books.
2. Thomas O. Allen and Alan P. Roberts. Production Operations — well completion, workover and stimulation, Volume 2. 1989. Oil and Gas Consultants International Inc., Tulsa, Oklahoma, USA.
3. Michael j. Economides et al. Petroleum Production Systems. 1994. Prentice Hall PTR, New Jersey.

Reference Books:

1. Howard B. Bradley. Petroleum Engineering Handbook. 1987. Society of Petroleum Engineers, TX, USA.

2. E. Dendy SloanClathrate Hydrates of Natural Gases — Third Edition. 2008. CRC Press, Taylor & Francis Group.
3. Larry W. Lake. Petroleum Engineering Handbook — Production Operations Engineering, Volume IV. 2007. Society of Petroleum Engineers.