

Course Name: Petroleum geomechanics and field applications

Course Instructor: Dr. Rajesh R Nair, Professor, Petroleum Engineering Programme,
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Objectives: The objective of the course "Petroleum Geomechanics and Field Applications" is to provide students with a comprehensive understanding of the principles, theories, and practical applications of geomechanics in the petroleum industry. Students will learn the mechanical behavior of rocks, stress and strain analysis, and their impact on reservoir engineering, wellbore stability, hydraulic fracturing, and production operations. The course aims to equip students with the knowledge and skills necessary to analyze and mitigate geomechanical risks and optimize field operations for safe and efficient petroleum extraction.

Course Contents:

Introduction to Petroleum Geomechanics: Overview of geomechanics in the petroleum industry, Role of geomechanics in wellbore stability, reservoir characterization, and production operations

Rock Mechanics Fundamentals: Mechanical properties of rocks: stress, strain, and deformation, Elasticity, plasticity, and failure criteria of rocks, Laboratory testing techniques for rock characterization

Stress and Strain Analysis: Concepts of stress and strain in rocks, Stress distribution and its effects on reservoir performance, Stress measurement techniques and interpretation

Reservoir Geomechanics: Geomechanical in reservoir characterization, Rock properties and their impact on reservoir behavior, Reservoir stress state analysis and its influence on production operations

Wellbore Stability Analysis: Causes and mechanisms of wellbore instability, Wellbore failure analysis and mitigation strategies, wellbore stability prediction models

Hydraulic Fracturing Design and Optimization: Principles and design of hydraulic fracturing operations, Optimization techniques for maximizing fracturing effectiveness

Geomechanics in Production Operations: Geomechanical in production and reservoir management, Analysis of induced stress changes, Geomechanical aspects of enhanced oil recovery methods

Laboratory Testing and Interpretation: Rock sample preparation and laboratory testing techniques, Interpretation of geomechanical data and parameters, Correlation between laboratory tests and field behavior

Field Applications and Case Studies: Analysis of real-world geomechanical challenges in petroleum operations, Application of learned concepts to case studies

Reference Text books:

Zoback, Mark D. (2010). Reservoir Geomechanics. Cambridge University Press.

Fjar, E., Holt, R. M., Raaen, A. M., Risnes, R., & Horsrud, P. (2008). Petroleum related rock mechanics (Vol. 53). Elsevier.