PGE 544: Rock Mechanics

Course Instructor:

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Course Learning Objectives:

By the End of this Course, Students are Able to:

1. Define Stress and Strain in Rocks.
2. Understand Rock Engineering Projects and Mechanical Behavior of Rocks.
3. Characterize Rock Deformation Modes, Rock Mechanical Properties (Destructive and Non-Destructive), and Laboratory Tests.
4. Derive and Utilize Linear-Poroelastic Solution of Stress on Deep Rocks.
5. Understand and Utilize the Concept of Yield-Zone Theory.
6. Understand and apply Mohr-Coulomb Failure Criterion and the Effect of Pore Pressure on Rock Strength.
7. Calculate Mohr-Coulomb Failure Criterion Parameters and its Applications.
8. Estimate Young's Modulus and Poisson's Ratio Using Experimental Data.
9. Estimate of Mohr-Coulomb Failure Parameters Using Correlations.
10. Utilize the Gained Rock Mechanics Knowledge in Rock Mechanics Applications in Petroleum Engineering Practices.
11. Write and Present a Term Paper Relevant to This Course.

Assessment Criteria:

1. Mid-term Exam 1: 20 Points
2. Mid-term Exam 2: 20 Points
3. Term Paper: 20 Points
4. Final Exam: 40 Points

Course Contents:

Chapter One: Introduction to Rock Mechanics.
Chapter Two: Rock Engineering Applications.
Chapter Three: Mechanical Behavior of Rock.
Chapter Four: Concept of Rock Failure Mechanics.
Chapter Five: Coring and Core Preparation for Mechanical Tests.
Chapter Six: Laboratory Rock Testing and Characterization.
Chapter Seven: Linear Poro-Elastic Solution for Stress State around Boreholes.
Chapter Eight: Yield-Zone Theory for Stress State around Boreholes.
Chapter Nine: Rock Mechanics Applications in Petroleum Engineering Practices.

Example References:

1. OnePetro Database in Addition to Worldwide Available Economic Data.
2. Jaeger J.C. and Cook N.G.W. : "Fundamentals of Rock Mechanics." 3rd edition, Chapman and Hall, London, 593p., 1979.
3. Fjaer, E., Holt, R. M., Horsrud, P. , Raaen, A. R. and Risnes, R "Petroleum Related Rock Mechanics.", Elsevier Science Publishers B. V., Amsterdam, The Netherlands, 338p., 1st edition, 1992.
4. Jumkis, A. R. : "Rock Mechanics.", 2nd edition, Gulf publishing company, Houston 1983.
5. PGE 544: "Rock Mechanics" Notes and Handouts by Professor Musaed AlAwad, King Saud University, College of Engineering, Petroleum and Natural Gas Engineering Department, Riyadh, Saudi Arabia.