Course Type	Course Code	Name of Course	L	T	P	Credit
DP (Hons)	NGLH302	Geomechanics Practical	0	0	3	1.5

Course Objective

The course is designed to complement the theory course of Geomechanics for subsurface engineering. The objective is to introduce students to the hands-on practical components of geomechanics in energy, infrastructure, and natural resource exploitation.

Learning Outcomes

Upon completion of the course, students will be able to:

1. Gain practical experience of the concepts of geomechanics.
2. Learn the various applications of geomechanics in natural resource exploration.
3. Understand the role of geomechanical principles in the safety of infrastructure.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Rock core logging and description Description of rock cores, Fracture logging, core recovery, and RQD calculation	1	Students will learn to describe rock cores and calculate recovery while core drilling
2.	Index properties estimation Water saturation, bulk and grain density, porosity	1	Students will learn the concepts of water saturation and porosity.
3.	Uniaxial Compressive Strength test Preparation of rock cores for UCS test, perform UCS test, stress-strain analysis, data plotting, rock classification based on strength	2	Students will gain practical knowledge of the strength of rock mass
4.	Brazilian Tensile Strength Calculation of BTS using disc-shaped samples	1	Students will learn how to estimate rock tensile strength (indirect) from disc samples
5.	Point Load index test Calculation of PLI using irregular samples.	1	Students will learn how to estimate rock compressive strength from irregular samples
6.	Fracture toughness study using semicircular bending (SCB) specimens	1	Students will understand the concepts of fracture creation and propagation in rocks.
7.	Direct Shear Test-Rock Joint Friction Measure shear strength parameters (cohesion, friction angle) of a sample or rock discontinuity.	2	Students will learn about the shear strength of rock joints
8.	Schmidt Rebound Hardness Test Quickly estimate surface hardness and approximate UCS of rock samples.	1	Students will learn the indirect method of UCS estimation in the field
9.	Permeability Test (Darcy's Law) Measure permeability of a rock or soil sample to illustrate Darcy's law	1	Students will gain practical experience of the fluid flow in rocks
10.	Grain size analysis Measure the grain size distribution, mean grain diameter, sorting, D_{60}, D_{10}	1	Clear understanding of the grain geometry parameters and their physical effects on fluid flow

11.	Geophysical Log study and Ultrasonic wave velocity Measure elastic wave velocity in rocks and characterize geomaterials based on geophysical logs	1	Students will learn how to estimate physico-mechanical properties in the subsurface from geophysical logs
12.	Assessment and examination	1	
Total Classes		14	

Textbooks:

1. Fundamentals of Rock Mechanics by Jaeger, J.C. and Cook, NGW, and Zimmerman, R.W., Blackwell Publishing, 4th Edition
2. Reservoir Geomechanics by Mark D. Zoback, Cambridge University Press, 2010
3. Introduction to Rock Mechanics, Goodman, RE, Wiley, Second Ed

Reference Books:

1. Poroelasticity, Alexander H.- D. Cheng, Springer, 2016
2. Rock Failure Mechanisms, Chun'an Tang and John A. Hudson, CRC Press, 2011
3. Structural Geology, Haakon Fossen, Cambridge University Press, 2010
4. Tunnelling in Weak Rocks, Bhawani Singh and R.K. Goel, Elsevier, 2006
5. Petroleum Related Rock Mechanics, E. Fjær, R.M.Holt, P.Horsrud, A.M. Raaen & R.Risnes, 2nd Edition, Elsevier