Course Type	Course Code	Name of Course	L	T	P	Credit
DC (Hons)	NGLH301	Geomechanics	3	1	0	4

Course Objective

The course's primary objective is to introduce students to the fundamental aspects and applicability of geomechanics in energy, infrastructure, and natural resource exploitation.

Learning Outcomes

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

1. Understand the basic 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.	Definition, methods, inherent complexities, and field of application of geomechanics. Classification and index properties of rocks.	2	This unit will give students an introductory outlook on geomechanics.
2.	Concept of stress and strain in geologic materials, their types, mechanisms, and the constitutive laws governing their behavior, poroelasticity and effective stress, elastic moduli and seismic wave velocity, Rock strength and various failure criteria, Coulomb, Mohr and Griffith criteria; Empirical criteria.	12	This unit will acquaint the students with rock deformability and failure under various stress conditions.
3.	Subsurface stress fields, relative stress and Anderson's classification, pore pressure at subsurface, its mechanisms, and estimation, time-dependent failure in rock, strain hardening and softening.	8	This unit will help the student learn the fundamental rock-mechanical processes occurring in the subsurface.
4.	Rock failure under different stress regimes, rock deformation analysis, rock strength in compression, tension, and shear, compressive strength criteria, strength and pore pressure, estimating rock strength from geophysical logs, rock strength anisotropy, frictional strength of rocks, stick-slip behavior	9	This unit will help the students understand the failure behavior of rocks under different stress conditions and their interpretations.
5.	Fracture mechanics, definitions, processes, different modes of fracturing, and criteria explaining rock fracturing	7	This unit will help students understand the concepts of fracture creation and propagation in rocks.
6.	Application to underground openings, slope stability, and wellbore stability, land subsidence, and fluid-induced seismicity.	4	This unit will provide a comprehensive idea of the potential solutions offered by geomechanics to various engineering problems.
Total Classes		42	

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