

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGLD403	Fundamentals of Rock Engineering	3	0	0	3
<b>Course Objective</b>						
The primary objective of the course is to introduce fundamental aspects of rock engineering						
<b>Learning Outcomes</b>						
Upon completion of the course, students will be able to:						
<ul style="list-style-type: none"> <li>Understand the engineering properties of rocks and their behaviour during rock engineering project.</li> <li>Understand the application of AI/ML in rock engineering.</li> </ul>						
Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome			
1.	<b>Introduction:</b> Objective, scope and basic problems of rock engineering.	2	Introduce to fundamental aspects of rock engineering.			
2.	<b>Site investigation and geological data collection:</b> Planning an investigation program, Site reconnaissance, Geologic mapping, Spacing, persistence and roughness measurements	3	Know about collection of data through engineering geological field investigations.			
	<b>Engineering properties of rock:</b> Engineering properties of rock, Laboratory tests for various engineering properties.	6	Understand the engineering properties of rock.			
	<b>Rock mass Classification:</b> Rock mass classifications and their applications in support design, predicting rock mass quality using AI/ML.	6	Concept of rock mass classification. Application of AI/ML in prediction of rock quality.			
	<b>Failure criteria of rockmass:</b> Concept of failure criteria for rock and rock mass, Mohr-Coulomb Criterion, Hoek-Brown Criterion; Griffith's theory.	6	Understand the failure criteria of rock and rockmass.			
	<b>Rock strength properties and their measurement:</b> Shear strength of rock joints, Deformability of rock joints, Joint wall roughness coefficient, Joint wall compressive strength, Normal and shear stiffness of rock joints, Laboratory testing of shear strength.	6	Know about strength and deformability of jointed rock mass.			
	<b>Slope engineering:</b> Modes and mechanism of slope failure; Planar, wedge, topping and circular failures analyses, monitoring of slope movements, stabilization of rock slopes, application of AI/ML in rock engineering.	7	Concept of mechanism of slope failure. Prediction of stability of slopes using AI/ML.			
	<b>Numerical methods and its applications:</b> Numerical modeling of rocks and rock masses, Application to landslide hazard zonation, tunnels, underground structures and rock slopes.	6	Basic understanding of various numerical methods and its applications.			
Total Classes		42				

**Textbooks:**

1. Jaeger, J.C; Cook, N.G.W. and Zimmerman,R, Fourth Edition, Fundamentals of Rock Mechanics, Blackwell Publishing, 2007.
2. Goodman, R.E., Introduction to Rock Mechanics, Second Edition, John Wiley & Sons, 1989.

**Reference Books:**

1. Hudson, J.A. et al. (Ed.), Comprehensive Rock Mechanics, in 5 volumes, Pergamon Press, 1993.
2. Ramamurthy, T., Engineering in Rocks for Slopes, Foundation and Tunnels, Prentice Hall India Pvt. Ltd., 2014.