Course Type	Course Code	Name of Course	L	T	P	Credit
DP1	**NMNC504**	Computational Geomechanics and Ground Control Lab	0	0	3	1.5

Course Objective

To understand and simulate the behaviour of the rock mass surrounding the underground excavation

Learning Outcomes

Upon successful completion of this course, the students should be able to:

- learn the practical aspects of stress-deformations induced in the U/G structures with different shapes and surrounding rockmass
- develop good understanding in optimization of support system to be provided under different insitu conditions.
- design the stable slopes and identify different failure of slopes

S. No.	Topics	Contact Hours	Learning Outcome
1.	Methods for determination of compressive strength, modulus of Elasticity and Poisson's ratio of rock	**03**	Understanding the geomechanical properties of rockmass affecting stability of underground structures
2.	Methods for determination of tensile strength of rock	**03**	Learning the tensile failure of rock
3.	Methods for determination of triaxial strength of rock	**03**	Understanding the importance of triaxial strength of rock
4.	Assesing load deformation behaviour of friction properties of rockmass	**03**	Learning the load deformation behaviour of friction properties of rock
5.	Assesing load deformation behaviour of hydraulic properties of rockmass	**03**	Learning the load deformation behaviour of hydraulic properties of rock
6.	Conducting rock bolt pull-out test in laboratory	**03**	Analysing the strength and deformation behaviour of rock bolt under given field condition
7.	Demonstration of setup for determination of insitu stresses using hydrofracturing technique	**03**	Understanding method of insitu stress determination
8.	Demonstration of strata monitoring instruments	**03**	Understanding importance of strata monitoring instruments
9.	RMR classifications	**03**	Understanding importance and determination of RMR classifications
10.	Analysis of circular tunnels and rock support interaction modelling	**03**	Observing response of tunnel support under given loading condition
11.	Dynamic response of tunnel lining under blast load	**03**	Analysing the lining response and deformations in surrounding rockmass under blast load
12.	Analysis of slopes using the material properties determined through laboratory tests.	**03**	Observing major factors responsible for slope failure and choosing remedial measures for the same.
13.	Mine subsidence Modeling	**03**	Observing mine subsidence in the challenging ground conditions
14	Practice & Review	**03**	
	Total	**42**	

Text Books:

1. Finite Element method: Concepts and Applications in Geomechanics Second Edition (2013) by Debasis Deb.
2. Fundamental of Rock Mechanics (2012) Fourth Edition by J.C. Jaeger and N.G.W. Cook.
3. Introduction to Rock Mechanics (1989) by R.E. Goodman.
4. Finite Element Procedures (1996) by K.J. Bathe.
5. Concept and Application of Finite Element Analysis (2001) by R.D. Cook
6. Fundamentals of Finite Element Analysis (2004) First Edition by David V. Hutton.

Reference Books:

1. Practical Manual and relevant suggested standards (ISRM, BIS, ASTM)
2. Underground Excavations in Rock (1980). Institution of Mining and Metallurgy, London. E. Hoek, and E. T. Brown.
3. Advances in Rock-Support and Geotechnical Engineering (2017) by Shuren Wang, Paul C. Hagan and Chen Cao.
4. Computational Geomechanics (1999) by Chan Zienkiewicz, A. H. C. M. Pastor, B. A. Schrefler and T. Shiomi.
5. Engineering Rock Mechanics -An Introduction and Principles (1997) by J.P. Hudson and J.P. Harrison.