Course Type	Course Code	Name of Course	L	T	P	Credit
DP3	**NMNC506**	Numerical Modeling Lab	0	0	3	1.5

Course Objective
Students will learn the numerical modelling technique related to the practical applications of rock mechanics.
Learning Outcomes
Students will gain the knowledge of different numerical methods like FEM, FDM, BEM using available simulation software and Matlab. It will help the students to understand the practical rock engineering design approaches

Unit No.	Topics to be covered	Contact Hours	Learning Outcomes
1	To perform finite element analysis of stress around a circular tunnel	3	Students will be able to carry out FE analysis of a circular tunnel in available software and compare the results with the analytical methods to develop confidence in numerical analysis.
2	To perform slope stability analysis using LEM	3	Students will be able to understand the concepts of slope stability using limit equilibrium method.
3	To perform finite element analysis for estimation of stress and strength of a coal pillar	3	Students will understand the distribution of stresses in a pillar and assess the factor of safety of a mine pillar
4	Modelling of sequence of excavation and design of metal mine stopes or cavern	3	Students will be able to understand the influence of excavation stages on stress distribution in a metal mine stope or a cavern
5	Estimation of rock load height for support design	3	Students will be able to draw the factor of safety contours around an excavation and decide about the support requirements
6	Modelling of water dam	3	Students will be able to carry out Dam stability analysis
7	Simulation of mine back filling	3	Students will be able to understand the stress changes with and without back
8	Perform analysis of parting / barrier pillar between the open pit and underground	3	Students will be able to design the surface barrier pillar
9	Matlab Fundamentals and manipulations of matrices	3	Understanding of the fundamentals of Matlab and basic operations
10	PDE toolbox in Matlab	3	Students will develop an understanding of the partial differential tool box of Matlab
11	FE Problems in Matlab	3	Students will ve able to carry out FE analysis of simple problems using Matlab for FEM
12	Mini Project	6	Students will gain a hands on experience on project of their choice
13	Practice & Review	3	
	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. Finite Element Procedures (1996) by K.J. Bathe.
4. Concept and Application of Finite Element Analysis (2001) by R.D. Cook

5. Fundamentals of Finite Element Analysis (2004) First Edition by David V. Hutton.

Reference Books:

1. Rocscience User Manuals on Institutional Repository
2. Ansys User Manuals on Institutional Repository
3. Matlab User Manuals on Institutional Repository