

SEVENTH SEMESTER

Course Code 7N1	Ground Control in Mines	L - T - P 3 - 0 - 2
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Unit 1

Engineering Rock Mass Classification

Practical significance of classification of rock masses, Bieniawski's RMR Classification Scheme & Laubscher's modification, Barton's Q- Classification Scheme, Excavation Support Ratio & Average Stand-up Time, Rock Structure Rating, CMRI Classification Scheme and its use in determination of appropriate support system for an underground mine

Unit 2

Stresses Around Underground Openings

Types of Openings - single & multiple openings, shapes of openings; Induced stresses around openings using classical closed - form solutions; Design considerations in selection of openings; Elementary introduction to concepts of numerical analysis methods - Finite Element Method (FEM), Boundary Element Method (BEM) and Hybrid Methods.

Pillar Design

Estimating average pillar stress by Tributary Area Method and its criticism; Factors affecting pillar strength; various important formulae for determination of pillar strength; Factor of Safety of pillars; Steps in design of pillars.

Unit 3

Rockbursts

Caving characteristics of roof rocks; Definition, types & phenomenology of rock bursts; Factors affecting proneness to rock bursts; Prediction of rock bursts; Monitoring of rock bursts - methods & instrumentation; Prevention & control of rock bursts; Bumps and Gas outbursts.

Unit 4

Subsidence

Definition - sub-surface & surface subsidence; Important theories of subsidence; Types of surface subsidence; Factors affecting subsidence; Related terminology; Subsidence profiles (lateral & vertical movement, strain curves); Subsidence prediction; Subsidence survey; Prevention & control of subsidence.

Unit 5

Monitoring Ground Movement

Purpose; Instruments for monitoring ground movement - Strain gauges, Strain rosettes, LVDT, Doorstoppers, Load Cells, Extensometers & Penetrometers, Microseisms, Geophones etc.

Photoelasticity

Principle & applications

Drillability, Cuttability and Blastability of rocks

Unit 6

Slope Stability of Opencast Benches

Effect of pit slope on mine economics; Common modes of slope failure; Factors affecting slope stability; Techniques of slope stability analysis; Measures to enhance stability of and to monitor & protect slopes.

Approved
[Signature]
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Training Engg.

Unit 1

Introduction

The term 'Environment'; Essential elements/ingredients of environment; Environmental issues in industry in general – national & global; Statutory regulatory bodies on monitoring & control of environmental pollution; Impact of mining (underground, surface & associated) activities on environment

Unit 2

Air Pollution

Desirable composition of mine air; Sources of air pollution in underground and surface mines; Monitoring (periodic and continuous) of mine environment; Statutory provisions; Control measures

Unit 3

Water Pollution

Impact of mining on availability (downward migration of water table and its effect on quantum of ground water resource and surface vegetation) and quality of ground water and surface streams; Adverse effect of water pollution on crops and other flora; Monitoring, treatment and disposal of effluent water; Water management

Unit 4

Sound Pollution

Noise, ground vibration, air blast, fly rocks, damage to surface structures and other related problems due to blasting in mines; Sources of sound pollution and ground vibration; Monitoring of noise produced by machinery & blasting; Control of noise & ground vibration

Unit 5

Societal Environment

Socio-economic impacts of mining activities; Issues of resettlement and rehabilitation of displaced population;

Land Environment

Visual impacts; Impacts on land use; Land reclamation (including landscape planning); Subsidence management

Unit 6

Environmental Administration

Environmental administration & management in India; Environmental Impact Assessment and Environment Management Plan; Environmental audit