



# ROCK MECHANICS AND TUNNELING

## PROF. DEBARGHYA CHAKRABORTY

Department of Civil engineering  
IIT Kharagpur

**PRE-REQUISITES :** Engineering Mechanics, Soil Mechanics, Soil Mechanics

**INTENDED AUDIENCE :** B.Tech./B.E., M.Tech./M.E., Ph.D.

**INDUSTRIES APPLICABLE TO :** Most of the Civil infrastructure development companies and the Companies dealing with the mining operations.

### COURSE OUTLINE :

A good understanding about the mechanics behind the load transfer mechanism and the stability of different geotechnical structures constructed in/on the rocks becomes very much essential for the civil and mining engineers. On the other hand, the tunneling is a very efficient solution for the public transport as well as other underground transport systems. The course 'Rock Mechanics and Tunneling' will give an overall idea about the rock mechanics and its applications.

### ABOUT INSTRUCTOR :

Prof. Debarghya Chakraborty is presently an Assistant Professor in the Department of Civil Engineering, IIT Kharagpur. He has received Ph.D degree from IISc Bangalore. He has completed M.Tech from IIT Bombay and B.Tech from Jalpaiguri Government Engineering College. He works primarily in the area of Computational Geomechanics. Presently he has 45 journal publications. He already has supervised one Ph.D student and ten M.Tech students. He has received different awards, such as,

(i) Prof. N. S. Govinda Rao GOLD MEDAL from the Indian Institute of Science Bangalore for the best Ph.D. thesis in the Department of Civil Engineering;

(ii) YOUNG SCIENTIST AWARD of The Indian Science Congress Association in the Section of Engineering Sciences;

(iii) YOUNG ENGINEERS AWARD of The Institution of Engineers (India) in the Civil Engineering Discipline,

(iv) EXCELLENT PAPER AWARD to Junior Individuals from the International Association for Computer Methods and Advances in Geomechanics.

### COURSE PLAN :

**Week 1:** Introduction: objective, scope, and associated problems; Discontinuities in rock; Classification of the rock based on origin.

**Week 2:** Methods for rock exploration: rock coring, geophysical methods.

**Week 3:** Physico-mechanical properties of rock.

**Week 4:** Laboratory testing on rock sample and in-situ testing of rock mass.

**Week 5:** Rock mass classification systems.

**Week 6:** Rock and rock mass failure criteria.

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**Week 8:** Applications of rock mechanics: slopes, underground excavations.

**Week 9:** Applications of rock mechanics: foundations, rock support systems.

**Week 10:** Basic features of tunneling: shapes, usages, methods of construction, problems associated with tunnels, tunneling in various subsoil conditions and rocks.

**Week 11:** Analysis of stresses: methods to determine stresses around openings, Kirsch equation, Greenspan's method. Basic concepts for lined, unlined, and pressure tunnels.

**Week 12:** Improvement of rock mass response: rock bolts, rock anchors, steel mats, precast concrete segments, shotcrete, grouting etc.