UNDERGROUND SPACE TECHNOLOGY

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IIT Roorkee

INTENDED AUDIENCE : B.Tech./BE/M.Tech/ME/PhD students, Professionals working in relevant field

INDUSTRY SUPPORT : Industries involved with infrastructure development in hilly terrain and mining shall recognize /value this course.

COURSE OUTLINE :

Objective of this course is to impart knowledge of methods of analysis and design of underground excavations in rocks and jointed rock masses for hydro-power projects and large underground storages for various purposes.

ABOUT INSTRUCTOR :

Prof. Priti Maheshwari, Professor in Department of Civil Engineering, IIT Roorkee, has her research interests in Soil , AI Structure Interaction, Ground Engineering: Modeling and Analysis, Statistical / Probabilistic Approaches to Strength Criteria for Rocks and Rock Masses. She has been teaching various UG/PG/PhD courses pertaining to Geotechnical Engineering for more than last 15 years and well appreciated by the students for her systematic approach towards teaching. She has supervised 04 Doctoral and 20 Masters Theses. She has one chapter in book titled ‚ÄúGeotechnical Engineering Handbook‚Äù, 49 research publications in National and International refereed journals to her credit.

COURSE PLAN :

Week 1-2: Rock Engineering Basics: rocks and rock masses, physical and mechanical properties, classification and failure criteria, planning of and exploration for various underground construction projects

Week 3: Stereographic projection method, principle and its application in underground excavation design

Week 4-7: In-situ stress, elastic stress distribution around tunnels, stress distribution for different shapes and under different in-situ stress conditions, Greenspan method, design principles, multiple openings, openings in laminated rocks, elasto-plastic analysis of tunnels, Daemen's theory

Week 7-8: Application of rock mass classification systems, ground conditions in tunneling, analysis of underground openings in squeezing and swelling ground, empirical methods, estimation of elastic modulus and modulus of deformation of rocks, uni-axial jacking /plate jacking tests, radial jacking and Goodman jacking tests, long term behaviour of tunnels and caverns, New Austrian tunneling Method (NATM), Norwegian Tunneling Method (NMT), construction dewatering

Week 9-11: Rock mass-tunnel support interaction analysis, ground response and support reaction curves, Ladanyi's elasto-plastic analysis of tunnels, design of various support systems including concrete and shotcrete linings, steel sets, rock bolting and rock anchoring, combined support systems, estimation of load carrying capacity of rock bolts.

Week 12: In-situ stress, flat jack, hydraulic fracturing, single and multi-point bore hole extensometers, load cells, pressure cell. Instrumentation and monitoring of underground excavations, during and after construction, various case studies.