

Tunnelling and Deep Excavation

Program Description

Course Name	Tunnelling and Deep Excavation
Course Name as on Certificate	Certification in Tunnelling and Deep Excavation
Certificate Type	Certificate of Completion by IITM Pravartak and L&T EduTech
Certificate Issued by	IIT MADRAS and L&T EduTech
Course Description	<p>Expanding cities necessities vertical expansions above and below the ground. Effective usage of underground spaces for transportation and storage facilities is the key to achieve these expansions. A comprehensive understanding of the execution of deep excavations for construction of these underground facilities is vital for an Engineer in this infrastructure era. This course has a systematic and concise treatment to geological and geotechnical aspects of deep excavations and tunneling, Construction methodologies for tunnels, caverns and shafts, Instrumentation monitoring of underground construction, Support systems for deep excavations, Software tools like PLAXIS 2D, WALLAP, RocLab and code provisions in deep excavations and tunnels.</p> <p>Objective:</p> <ul style="list-style-type: none"> • To introduce various underground structures such as tunnels, caverns, shafts and UG stations. • To explain the construction methodology, support systems like diaphragm walls, sheet piles and challenges in the constructions of tunnels, caverns, shafts, and stations. • To cover design aspects in the field on geotechnical/rock engineering and tunneling, Instrumentation and monitoring of tunnels. • To introduce geotechnical software tools.
Educational Qualification	<ul style="list-style-type: none"> • Students pursuing Diploma / UG / PG Programs in Civil and other allied domains • Faculties in the field of Civil and other allied domains • Working professionals in the above domains
Pre Requisites	Soil Mechanics, Foundation Engineering, Structural Analysis
Course Content	See Enclosed Programme details – as Annexure 1
Pedagogy	Online Self-paced E-Learning Content
Assessment	One Final Assessment

Programme Faculty	<p>Dr.G.D Raju, L&T Construction Dr.G.D Raju is a Rock & geomechanics Engineer and a former Scientist at “National Institute of Rock Mechanics” . He earned his PhD from McGill University, Canada and has experience in working in projects across India, Canada, Singapore and Bhutan. With extensive experience of over 25 years in the field of Mining, tunneling, oil and natural gas and Civil construction he heads the geotechnical division of Heavy Civil Infrastructure at Larsen and Toubro. He and his team are involved in design of tunnels, caverns, Foundation of bridges and geotechnical aspects of nuclear reactor projects.</p>		
Duration	Weeks: 14; Hours: 28		
Class Schedule	Self-Paced		
Programme Highlights/USPs	<ul style="list-style-type: none"> • Introduction to Underground Tunnels • Site Investigation • Tunnel Construction Methods • Tunnel Design Methodologies • Tunnel Support Systems • Instrumentation and Monitoring • Design and Construction of Deep Excavations • Caverns, Shafts and Underground Stations 		
Total Fees		Total Fees (Rs.)	
	Total Programme Fee	Rs. 5,100/- inclusive of Tax	

ANNEXURE 1

Proposed Course outline / programme / plan - Unit wise syllabus details.

Unit - I: Introduction to underground constructions and tunnelling

General Description of Various Tunnels and other underground structures, Components of a tunnel, Stress around an underground opening, Methods of excavations, Subsurface investigation
Surface investigation, Sampling Techniques, Laboratory and in-situ testing of soil and rock, Indian standard codes

Unit - II: Construction, challenges and solutions for Caverns, shaft and underground stations

Factors affecting the choice of method of tunnel construction, Cut and cover method, Bored method, Drill and blast method, Sequential excavation method and shaft method, Norwegian tunnel boring method (NTM), New Austrian tunnel boring method (NATM), Methods of construction of caverns and shafts and underground stations, Challenges and solutions for execution of these methods, Different types of Tunnel boring machines.

Unit - III: Design methodology, Instrumentation and monitoring for tunnels

Rock mass classification, Geotechnical and geological inputs for design, Empirical, semiempirical and joint set analysis, Numerical 2D modelling and final support recommendations, Need for Instrumentation and monitoring in tunnels, Types of Instruments - Planning and execution

Unit - IV: Support systems and design software for tunnels

Need for pre-excavation support system, Fore piling, Bolts and Anchors, Shotcrete, wire meshes, lattice girders and integrated support systems, Different types of retaining structures and their applicability. Secant piles, Sheet piles, contiguous piles and soldier piles and D wall. Requirement of investigation to be carried out for underground structure, Preparation geotechnical interpretation report for design of retaining structure, Numerical analysis to be performed for temporary / permanent retaining system, Introduction to software to be used in embedded retaining system, Case studies.

Unit - V: Indian and International Code provisions

Introduction to interpretation using Rock data, Introduction to Wallap, Introduction to Plaxis
Introduction to RS-2, Introduction to CIRIA 143, Wallap and their application Practical application & case studies