

LABORATORY OF TUNNELLING TECHNOLOGY

Teaching - Research subjects

ROCK MECHANICS		PRIMARY SUPPORT		TUNNELLING TECHNIQUES	
<p>1. CONSTITUTIVE LAWS: (a) Stress-Strain- (b) Elasticity, plasticity, anisotropy (c) Creep, (d) Consolidation, Swelling, Seepage (e) Fracture - poroelasticity and thermoelasticity, Stress concentration around cracks, micromechanics (f) Mechanical response of discontinuities</p> <p>2. ROCKDYNAMICS: (a) Stress waves, (b) Wave propagation, (c) Acoustic, electromagnetic, thermal emission.</p> <p>3. INSTRUMENTS: (a) Strain, (b) Stress, (c) Displacement, (d) Water pressure, (e) Physical emission</p> <p>4. LABORATORY TESTS: (a) Intact rock, (b) Discontinuities</p> <p>5. IN SITU TESTS: (a) Rock mass, (b) Discontinuities</p> <p>6. NATURAL STRESS FIELD</p>		<p>1. MINING: (a) Room Pillars, (b) Backfill, (c) Powered support</p> <p>2. INTERNAL: (a) Bolts, dowels, anchors, cables, (b) Forepolling, spiling, (c) Face anchors, (d) Micropiles</p> <p>3. EXTERNAL: (a) Shotcrete: wire mesh - fibers, lattice girders, RRS (Rib Reinforced Shotcrete) (b) Structural steel, Composite lining in Steel and Concrete, (c) Yielding elements, (d) Prefabricated elements.</p> <p>4. GROUND IMPROVEMENT: (a) Grouting, (b) Drainage-Water management, (c) Freezing, etc.</p> <p>5. ANALYSIS: (a) Continuum, (b) Discontinuum</p> <p>6. GEOSTATISTICS</p>		<p>1. BOUNDS: (a) Geometry, (b) Geology, (c) Monitoring</p> <p>2. SEQUENTIAL: (a) Explosives= Norwegian, Caverns (b) Mechanical Excavation= NATM, SCL (c) Full face= ADECO-RS, LaserShell (d) Particular positions</p> <p>3. CONTINUOUS: (a) TBM without or with shield, (b) Pipe Jacking</p> <p>4. CUT and COVER</p> <p>5. SHAFTS (a) Shallow, (b) Deep</p> <p>6. PERMANENT LINING: (a) Water proofing (b) Reinforcement (c) Concreting</p> <p>7. TUNNEL HISTORY: (a) Before gunpowder, (b) After gunpowder</p> <p>8. TUNNELLING VOCABULARY</p>	
EXPERIMENTAL (laboratory – in situ)	THEORETICAL (analytical – computational)	EXPERIMENTAL (laboratory – in situ)	THEORETICAL (analytic – computational)	DATA BASE	ARTIFICIAL INTELLIGENCE
<ul style="list-style-type: none"> • Standard tests • Response Signals – acoustic, electromagnetic, thermal emissions • Seepage 	<ul style="list-style-type: none"> • Displacement – fracture modes • Constitutive laws • Parameters and their equivalents • Micromechanics 	<ul style="list-style-type: none"> • Standard tests • Full scale girder tests • Monitoring at the ground surface (settlements etc), within the rock mass and on the tunnel (convergence, etc) 	<ul style="list-style-type: none"> • Analysis of Tunnel Response, etc. • Settlement analysis • Suitability of models • Reliability - Safety 	<p>Recording and processing data of: geometry, simulation, tunnelling, equipment, settlement - monitoring, advance, cost, contracts</p>	<ul style="list-style-type: none"> • Fuzzy logic • Neural networks • Expert systems • Standard codes, Suggested methods