UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Excavation and Improvement of Soils and Rocks

2324-2-F7401Q119

Aims

The main goal of the course consists in giving specific knowledge to the engineering geology to deal with geotechnical engineering problem for what concern superficial and underground excavations and method for improving the mechanical behaviour of geomaterial.

Contents

Engineering geology and geotechnical aspects relating to the superficial and underground excavation; improvement techniques of the geomechanical behavioiur of soils and rocks

Detailed program

The excavation work, purpose, characteristics of the rock masses and soils, types of excavations. The investigation and characterization of geological, hydrogeological and geotechnical / geomechanical design of excavations.

Surface excavation in soils

Excavation techniques on the surface. Excavations for the different types of civil works. Excavation of slopes. The excavation and support: Diaphragms and bulkheads. Induced subsidence in urban areas. Struts, ties and other solutions. Operational solutions for the excavation below the water table: methods for the control of the water .. Techniques of soil grouting. Excavation in soil: equipment, their performance and selection criteria. Case histories.

Surface excavations in rock masses

Excavation techniques on the surface. Excavations for the different types of civil works. Excavation of slopes. The excavation and support. Excavations in rock masses with mines, explosives and triggering methods, their characteristics and performance; machines for drilling holes for blasting, the mucking, transportation continuous and discontinuous. Excavation in rock masses by mechanical means: machines, their performance and selection criteria as a function of lithotype and purpose of the work. Case histories ..

Underground excavations in soils

The underground excavation. The types of spaces in underground excavation and support. Methods of construction of tunnels (mechanized and conventional) and underground cavities (caves, stations in urban habitat). Different techniques of excavation in relation to the traditional type of soil and interaction with the water regime. The mechanized escavation: TBM with open shielded. The parameters geological, hydrogeological and geotechnical design. Performance evaluation of excavation. Case histories. The excavation in soil with mechanized cutters on time, special methods. The full face excavation with EPB and SS-HS .. Conditioning the soil and laying concrete. Investigations during construction. Monitoring of underground work and surface. The ventilation systems, water treatment, special aspects. The microtunnelling. Description of machinery and excavation procedures. Case histories.

Underground excavations in rock masses The excavation by traditional methods: excavations in rock masses with explosives and mechanical means. The supports of the first and final phase. The excavation with mechanized methods: excavations in rock by local drilling machines The excavation full section with TBM with open and shielded. The parameters geological, hydrogeological and geotechnical design. Performance evaluation of excavation. Case histories.

Improvement techniques for soils and rocks

Problems and geological/environmental situations that may require emergency treatment and consolidation: the foundations of engineering works, natural slopes, earthworks, excavations on the surface and underground, exhaust systems, major infrastructure; historical centers and monuments. Methods of consolidation for soil: jet grouting, deep soil mixing. Geosynthetic materials and products: types, properties, applications. Methods of treatment and consolidation. Treatment, with or without added materials. Reinforcement. Intervention techniques for stabilization of slopes.

Prerequisites

Engineering Geology; Applied Geotechnics , Soil and Rock Laboratory Testing

Teaching form

- Theoretical Lessons, 16 hours

- Exercises , 24 hours

Textbook and teaching resource

- Manfred R. Hausmann. (2008). Engineering principles of ground modification, McGraw-Hill

-Notes and other references will be provided at the beginning of the course by the professor

Semester

1?? Semester

Assessment method

1) Scientific laboratory report (paper that illustrates the methods of carrying out the experimental tests faced during the scientific laboratory courses or educational exits)

2) Oral exam: interview on the topics performed in the lesson

Sufficiency is required in all 2 assessment methods

Office hours

Monday from 16.00 to 18.00

Sustainable Development Goals

QUALITY EDUCATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE | SUSTAINABLE CITIES AND COMMUNITIES