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COURSE: Engineering Geology II

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TEACHER: Francesco Sdao

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website:

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Language: Italian

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ECTS:

n. of hours:

Academic year:

Campus:

Semester:

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#### TOPICS

Engineering geological and geomechanical characterization of rock masses and geomechanical and lithotechnical classifications of the rock masses: classification of Beniawsky, Q\_system di Barton, Geological Strength Index; 2 Engineering geology to great works of engineering: studies, surveys and related engineering geological problems in the various stages of planning. 3. Mass movements: landslides and deep-seated gravitational slope deformations; Criteria and methods for the study of the landslides. Main types of the survey and in situ tests for the study of the landslide prone areas. Methods and techniques for monitoring the instability of the slopes. Landslide hazard and risk. Main methods for the assessment of the landslide hazard and risk (heuristic, statistical and deterministic methods). Artificial intelligence methods applied to landslide hazard assessment: fuzzy and neuro\_fuzzy logic and artificial neural networks.

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#### TEACHING METHODS (please tick one or more options)

Theoretical lessons

Tutorials in classroom

Tutorials in laboratory

Project works

Technical visits

Other activities (please specify) \_\_\_\_\_

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#### TEXTBOOKS

1. Lectures notes by the teacher

2. L. Scesi, M. Papini, P. Gattinoni ( 2001) – Geologia Applicata : il rilevamento geologico tecnico (vol. 1). Casa Ed Ambrosiana Milano

3. L. Scesi, M. Papini, P. Gattinoni ( 2001) – Geologia Applicata Applicazione ai progetti di ingegneria civile (vol. 2). Casa Ed Ambrosiana Milano

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#### ON-LINE EDUCATIONAL MATERIAL

web address: <https://sites.google.com/site/sdaofrancesco/home>

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#### LEARNING OUTCOMES

Ability of the students to use the main methods, both traditional and innovative, the techniques and the tools of the engineering geology and engineering geomorphology for: the study of rock masses; the definition of the engineering geological problems in the design of great works of civil engineering; to studies of the landslide prone areas; for the planning and managing of a plan for monitoring of the slope instability; the assessment and mapping of the landslide hazard and risk.

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#### REQUIREMENTS

No

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#### EVALUATION METHODS (please tick one or more options)

Intermediate verifications

Written examination

Discussion of a project work

Practical test

Oral examination

Other methods (please specify) \_\_\_\_\_

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#### DETAILED CONTENT

Engineering geological study of rock masses. Engineering geological characterization of intact and fissured rocks.

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Recognition, measurement and interpretation of geological and technical parameters of the structural discontinuities. Analysis and interpretation of data: stereographic projections (Schmidt and Wulff patterns). Geomechanical and lithotechnical classifications of rock masses. The classifications RMR of Bieniawsky and Q system of Barton, Geological Strength Index (GSI) system. Case studies. 2. Engineering Geology for great works of civil engineering (tunnels, dams, routes): studies, survey and tests in various stages of planning. Geological, geomorphological and hydrogeological surveys, in situ geognostic tests for the planning and realization of the tunnels. Geological problems of tunnels. The Dams: studies, surveys and monitoring techniques for the realization and for the resolution of geological problems. 3. Mass movements: types of landslides and related geomorphological and morphoevolutive features. Main landslide classifications (Terzaghi, 1950; Varnes 1976, Cruden & Varnes 1993). Character and definition of landslide activity. The rock landslides: falls, topples and rock slides. Methods of kinematic analysis for evaluation of rock slope instability: plane failure, wedge failure and toppling failure. Study of the landslide prone area: types of reliefs, in situ surveys. Criteria and methods of definition of the slope instability. Methods and techniques for monitoring the instability of the slopes. Principles, aim and operation of a monitoring system. Methods and tools for the estimation of surface movements of a landslide body. Methods and tools for estimating the deep movements of landslide. Inclinator probes. Innovative techniques of remote sensing in monitoring of the instability of slopes: Techniques GPS, SAR interferometry, Permanent Scatterers. The landslide hazard and risk. Main methods for landslide hazard and risk assessment. Heuristic, statistical, deterministic methods. Artificial intelligence methods applied to evaluation of landslide hazard: fuzzy logic, neuro fuzzy logic and artificial neural networks methods. 4. Elements of environmental legislation. 5. Methods and techniques for geomorphological study of the area: analysis and interpretation of thematic maps, analysis and geomorphological interpretation of aerial photographs. Case studies.

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SEMINARS BY EXTERNAL EXPERTS    YES X    NO

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FURTHER INFORMATION

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