Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Engineering Geology II			
ACADEMIC YEAR: 2017/2018			
TYPE OF EDUCATIONAL ACTIVITY: Characterizing			
TEACHER: Francesco Sdao			
e-mail: francesco.sdao@unibas.it		website: https://sites.google.com/site/sdaofrancesco/	
phone: +39 0971 205092		mobile (optional):	
Language: Italian			
ECTS: 6	n. of hours: 54 (38 hours: lessons 16 hours: tutorials/practice)	Campus: Potenza School: Engineering Program: Civil Engineering	Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course focuses on providing the students with the specialized knowledge and the most important tools and methods of applied geology: for the geological-technical and geomechanical study of rock masses; for the definition of geological-applicational problems and for the assessment of the environmental geological risk in the design and construction of civil engineering works (roads, dams, galleries); for the study, monitoring and assessment of landslide hazard and risk.

- Knowledge and learning skills:

The student has to demonstrate that he properly knows: the main methods for geological characterization and the geomechanical classification of rock masses; the main tools and the methods for studying the issues and assessing the geo-environmental risk in the design of civil engineering works; the criteria and methods for studying and monitoring the slope instability; the main models of landslide risk assessment, with particular reference to those that use the Artificial Intelligence.

- Ability to apply knowledge and understanding:

The student has to demonstrate to be able to: identify, analyze and interpret the results of the geological-technical surveys for the geomechanical classification of rock masses; define and evaluate the main geological-technical problems and the geo-environmental risk associated with the design and implementation of civil engineering works (roads, dams, galleries); investigate, analyze and define the landsliding an area; design, set up and manage a slope instability monitoring plan; apply assessment methods for the landslide risk, with particular reference to models using Artificial Intelligence (Artificial Neuronal Networks, Fuzzy Logic, Neuro-Fuzzy Models).

- Judgment autonomy:

The student has to be able to properly and independently deepen the knowledge gained in the applicative-geological field, being able, in particular, to assess the interference processes between the geological environment and the anthropic activity and the consequent geo-environmental risk by strictly applying the advanced and innovative study methods of the applied geology and to identify the most effective methods and tools to solve geological-applicative problems regarding the realization of Civil Engineering works. Such judgment autonomy will also be achieved through exercising and laboratory activities.

- Communicative skills:

The student has to be able to expose, in a simple and technically appropriate way, the results of his Applied Geology studies, presenting them both to the experts in the geological-applicative sector and to non-experienced people, using proper language and mastery of the arguments.

- Learning ability:

The student has to develop autonomous learning abilities through the use of innovative tools and methods (specialized texts, international scientific publications, ect) in the field of the Applied Geology, in order to be able to undertake and follow Postgraduate Specialization Courses (Master, Specialist Seminars), PhD programs, or to start an independent professional activity.

PRE-REQUIREMENTS

It is necessary to have acquired and assimilated the basic knowledge provided by the Applied Geology course.

SYLLABUS

1. Geological-technical study of rock masses. Geological-technical characteristics of intact and fissured rocks. 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. Applications to the case studies. (18 hours)
2. The geology applied to great works of civil engineering (tunnels, dams, routes): studies, survey, monitoring 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. The geological risk in the realization of civil engineering works: instruments and methods of evaluation (14 hours).
3. Mass movements: types of landslides and relative geomorphological and morpho-evolutive features. Main landslide classifications. Character and definition of the landslide activity. The rock falls: falls, topples and rock slides. Methods of kinematic analysis for rock slope instability assessment: 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 slope instability. 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. The inclinometers. Innovative techniques of remote sensing in monitoring of the slope instability: GPS techniques, SAR interferometry, Permanent Scatters. 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. (24 hours)

TEACHING METHODS

The course includes 54 hours of lessons and exercises in classroom and in laboratory.

In particular 38 hours of lessons and 16 hours of guided exercises in classroom and in laboratory are planned. At the end of the course a technical excursion is scheduled.

The students will have free access to the laboratory for further individual exercises.

EVALUATION METHODS

The aim of the exam test is to verify the level of attainment of previously mentioned training objectives.

The exam consists of a written test with 5 or 6 open questions concerning all the topics dealt in the course.
The duration of the test is scheduled in three hours.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

1. Notes provided by the teacher during the lessons and available on the site.
2. Textbooks:

- L. Scesi, M. Papini, P. Gattinoni (2001) – Geologia Applicata: Applicazione ai progetti di ingegneria civile (vol. 2). Casa Ed Ambrosiana Milano
- L. Scesi, M. Papini, P. Gattinoni, L. Longoni (2015): Geologia Tecnica. Casa Ed Ambrosiana Milano

INTERACTION WITH STUDENTS

At the beginning, after illustrating the course program, the training objectives and the profit testing methods, the teacher provides students the didactic material of the lessons (pdf documents). Simultaneously, he collects a list of students who intend to register for the course, together with name, surname, registration number and e-mail.

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Timetable of reception: Wednesday from 15:00 to 17:00 and Thursday from 8:30 to 10.30 in the professor office. In addition to weekly reception, the professor is available at all times for a contact with the students by e-mail.
EXAMINATION SESSIONS (FORECAST)[1] 7 febbraio 2018, 21 febbraio 2018, 4 aprile 2018, 21 giugno 2018, 11 luglio 2018, 25 luglio 2018, 19 settembre 2018, 17 ottobre 2018, 14 novembre 2018, 19 dicembre 2018.
SEMINARS BY EXTERNAL EXPERTS YES X NO □
FURTHER INFORMATION

[1] Subject to possible changes: check the web site of the Teacher or the Department/School for updates.