
COURSE: MECCANICA DEI GEOMATERIALI

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: Other

TEACHER: Vincenzo De Luca

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Language: **ITALIAN**

ECTS: n. **6**(n. **4** lessons and n. **2** tutorials/practice).n. of hours: **56 (32 lessons and 24 tutorials/practice).**Campus: **Potenza**

Dept./School:

Dipartimento di Scienze

Program: Scienze

Geologiche (**L34**).Semester: **2°**dal **02.03.2020** al **31 maggio-20 giugno 2020**

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course deals with the basic elements of continuum mechanics focused on the specific aspects concerning problems of geology matter. The main objective of the course is to provide students with the basic knowledge needed for studying and analysing geomaterials, both rocks and soil, considered as continuous media, which interest a geologist, with regard to the mechanical behaviour of materials.

The main knowledge provided will be:

- *basics of continuum mechanics;*
- *physical fundamentals of the mechanical behaviour of geomaterials;*
- *characteristics, mechanical properties and relative methods of measurement of ge materials.*

The main skills, ability to apply the learned knowledge, will be:

- *to analyze the physics of the mechanical behaviour of the materials which concern geology ;*
- *to identify the mechanical properties of the materials, proving to be able to apply the methods of analysis to real problems and case studies;*
- *to evaluate methods and practical applications, learned during the present course, to independently deal with problems and seek solutions, by using numerical methods for analysing the mechanical behaviour of rocks and soils, in classic practical problems of geology;*
- *to develop communication and interpersonal skills, in a professional background with interlocutors more or less specialists, during the course, through exercises conducted on practical cases, where there is an opportunity for dialogue among students, as a working group, on the proposed solutions.*

- **Knowledge and understanding:**
The student must demonstrate the knowledge and ability to understand the issues concerning the basic elements of continuum mechanics; physical fundamentals of mechanical behaviour of the geological materials, characteristics, mechanical properties and relative methods of measurement of geological materials.
- **Skill to apply knowledge and understanding:**
The student must demonstrate to be able to identify the characteristics and the mechanical properties of materials and to adopt numerical models for the mechanical behaviour of materials, rocks and soil, appropriate to the problem. Demonstrating, also, to be able to apply methods of analysis, learned in the course, to real problems and case studies, which are classics for the professional career of a geologist.
- **Independently judgment skills:**
The student must be able to independently evaluate the mechanical problems of geomaterials and to identify the main relevant methodologies of analysis to be used. The input provided through lessons and exercises, will give students the ability to formulate considerations on methods of analysis and practical applications, developed during the course, and at once to acquire the ability to independently deal with problems of analysis of mechanical behaviour of rocks and soils, in typical problems of the professional career of a geologist.
- **Communication skills:**
The student must have the ability to present and explain, in a simple manner, without special skills, a written report by correctly using the appropriate technical language. In particular, as part of the exercises on practical cases, an exchange of information among students is expected, within a working group, on the proposed solutions, thereby developing communication and interpersonal skills of professional capacity, with interlocutors more or less specialists.
- **Learning capacity:**
The student must be able to update their self, through consultation of bibliographical references, texts and technical manuals relating to professional geologist and related documents, such as geotechnical and theoretical papers, on numerical and experimental mechanics of materials, as well as to follow Specialized courses, Seminars and Masters.

PRE-REQUIREMENTS

The student must have acquired the following basic knowledge:

mathematics: algebra and analysis;

geometry;

- *physics: kinematics, statics, dynamics and thermodynamics.*
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SYLLABUS**Stress analysis** (1 ECTS of lectures)

Forces and tensions in a spatial continuous medium. Specific properties of the state of tension. Main components and invariants of tension. The Mohr circles for spatial stress states. The special case of plane stress. Indefinite equations of equilibrium in the continuum medium. Boundary conditions.

Deformation analysis (1 ECTS of lectures)

Kinematics of displacements in a continuous body. Deformations, physical interpretation and measure of deformation. Main components and invariants of deformation. The case of plane strain. Congruence conditions in a continuum medium.

Constitutive equations (1 ECTS of lectures)

Elasticity. Plasticity. Constitutive modelling.

General principles, balance equations (1 ECTS of lectures)

Solving the problem of a deformable continuous body.

Strength criteria (1 CFU Exercise)

Safety criteria in the elastic and plastic range.

Numerical applications in problems of mechanics of geomaterials (1 CFU Exercise)

Numerical methods for the analysis of problems of mechanics of geomaterials. Applications to case studies of geology.

TEACHING METHODS

The course includes 56 hours of teaching with lessons and exercises. In particular it is provided 32 hours of lesson in classroom and 24 hours of exercise in classroom.

The course is organized as follows:

- lectures on all subjects of the course (32 hours);
 - guided numerical exercises (24 hours);
 - individual exercise, assigned to each student, on a practical application of a geologist, accompanied by bibliographical research, numerical processing and written report, shared and discussed within the framework of a working group of students (to be carried out during the hours of individual study of student, with review by the teacher during the hours of reception).
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EVALUATION METHODS

The aim of the examination is to test the level of achievement of the previously mentioned educational goals.

The examination will take place in a unique moment, at the same day, and consists of:

an oral test in which the ability to link and compare different aspects, covered during the course and with the practical exercise, individually assigned to the student, will be evaluated.

The student passes the exam if achieves a mark of not less than 18/30.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Notes provided by the teacher during the course.

Text / reference:

- I-Shih Liu. *Continuum Mechanics*, Springer, 2002.
- Richard E. Goodman. *Introduction to Rock Mechanics*. Wiley, 1989.
- Salençon, Jean. *Applications of the Theory of Plasticity in Soil Mechanics*. John Wiley & Sons Ltd. 1977.
- William Powrie. *Soil Mechanics: Concepts and Applications*. CRC Press. 2013.
- Winthrop D. Mean, Sforzo e deformazione. *Principi di meccanica del continuo*. Dario Flaccovio Editore, 2005.
- G.E.Mase. *Meccanica dei continui*. ETAS Libri, 1976.

Specific topics may also be focused on texts suggested by the teacher, from time to time, during the course.

INTERACTION WITH STUDENTS

During the course, after describing the objectives, program and methods of verification, the teacher during the course will provide students the educational material.

Office hours: Wednesdays from 9:30 to 13:30 at the study of the teacher and Thursdays from 9:30 to 11:30 am at the study of the teacher.

In addition to weekly reception, the teacher is available at all times for a contact with the students, through his e-mail or phone vincenzo.deluca@unibas.it, phone 0971205438, mobile 3204371027.

EXAMINATION SESSIONS (FORECAST)¹

19/02/2020, 18/03/2020, 17/06/2020, 15/07/2020, 16/09/2020, 21/10/2020, 09/12/2020

SEMINARS BY EXTERNAL EXPERTS NO

FURTHER INFORMATION

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