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COURSE: GEOTECHNICS

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ACADEMIC YEAR: 2016-2017

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TYPE OF EDUCATIONAL ACTIVITY: Characterizing Civil and Environmental Engineering

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TEACHER: Caterina Di Maio

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phone: +39 0971205388

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mobile (optional):

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Language: ITALIAN (ENGLISH IF PREFERRED BY STUDENTS)

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ECTS: 9

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n. of hours: 81

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Campus: Potenza

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Semester: I

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course, which is the first one of the homonymous field (GEOTECHNICS), deals with the basic elements of soil mechanical behavior, i.e. the mechanics of porous granular media.

The main objective of the course is to provide the theoretical tools necessary for the study of the processes of interaction between the works of Civil and Environmental Engineering and the soil on which they are founded or with which they are constructed (dikes, dams), and necessary for the study of the mechanical behavior of natural or artificial slopes.

The main elements of knowledge that will be provided are:

- basic elements of mechanics of saturated granular media;
- laboratory and site testing procedures necessary for the physical and chemical characterization of soils;
- physical-mathematical modeling of seepage and consolidation processes;
- modeling and prediction of deformations and failure conditions of the systems soil - structures (foundations, retaining structures, slopes).

The main skills that are intended to be transmitted are:

- design of the site and laboratory investigations for the analysis of geotechnical problems;
  - definition of the soil theoretical models able to capture the most important aspects of soil behaviour;
  - definition of the mathematical models that best describe the physical processes;
  - calculation of the effects of load changes (stresses distributions) on soil behavior.
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#### PRE-REQUIREMENTS

Students must have acquired and assimilated the basic knowledge provided by the courses of "Mechanics of continuous media" and "Hydraulics" or "Fluid mechanics", and in particular:

- fundamentals of Continuum Mechanics, particularly those related to stress and strain, constitutive laws, elastic medium, plasticity, failure criteria.
  - Fundamentals of hydraulic potential properties, equations of motion of ideal and real fluids.
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#### SYLLABUS

1. Structure, physical and chemical characteristics of soils and their classification (8 hours).
  2. Stresses and strains in granular media, total stresses and effective stresses, distribution of effective stress in lithostatic conditions with hydrostatic groundwater (8 hours).
  3. Equations of water flow in steady state conditions - stresses in soils interested by water flow - driving forces - subsidence and transport phenomena (20 hours).
  4. Drained and undrained conditions induced by changes in stresses – Compressibility and Consolidation of soils - Tests for the determination of compressibility parameters - Calculation of deformation evolution over time (14 hours).
  5. Failure Criteria - Active and Passive Limit Equilibrium condition - Experimental determination of the deformability and shear resistance: triaxial tests and direct shear tests (14 hours).
  6. Site investigations - Piezometers and Inclinometers – CPT, SPT, etc. (10 hours).
  7. Application to Engineering Problems (limit load and settlements of foundations, earth pressures on vertical retaining walls) (7 hours).
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#### TEACHING METHODS

81 hours of: Theoretical lessons, Classroom tutorials, Laboratory tutorials, Project works, Technical visits

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#### EVALUATION METHODS

Written examination or Oral examination, as preferred by the student. In both cases the exam consists of two theoretical questions and one exercise.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Caterina Di Maio provides her own material (<http://www2.unibas.it/dimaio/materiale.html>).

and suggests the following textbooks

R. Lancellotta – Geotecnica – Zanichelli

T.W. Lambe & R.V. Whitman – Meccanica delle Terre – Flaccovio Editore

J. Atkinson – Meccanica delle Terre e delle Fondazioni – McGraw-Hill

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#### INTERACTION WITH STUDENTS

At the beginning of the course, after the description of the course program, aims, and exams procedures, Caterina Di Maio indicates the teaching material (<http://www2.unibas.it/dimaio/materiale.html> website). She collects the list of the students who attend the course (name, surname, telephone number and email address).

The teacher generally receives students on Tuesday from 9 alle14 in her office (School of Engineering, Geotechnical laboratory) but also she can be contacted by e-mail ([caterina.dimaio@unibas.it](mailto:caterina.dimaio@unibas.it)) anytime the students need her help.

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#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

06/01/17, 03/02/17, 03/03/17, 07/04/17, 05/05/17, 02/06/17, 07/07/17, 28/7/17, 08/09/17, 06/10/17, 10/11/17, 09/12/17

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SEMINARS BY EXTERNAL EXPERTS      YES x

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#### FURTHER INFORMATION

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