
COURSE: SOIL CHEMISTRY

ACADEMIC YEAR: 2018/2019

TYPE OF EDUCATIONAL ACTIVITY: Related disciplines

TEACHER: Sabino Aurelio Bufo

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Language: English

ECTS: 6 (lessons 4,
tutorials/practice 2)n. of hours: 56 (lessons 32,
tutorials/practice 24)Campus: Potenza
Dept./Sciences
CdS: Geosciences-and –Geo
resources **(LM74)**Semester: I
01 ottobre 2018 al 20
dicembre 2018/20
gennaio 2019

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

This course gives a contribution to the knowledge of environmental sustainability, with a particular emphasis to the use and preservation of soil.

Students shall consider the soil as a primary asset that can be used for human activities without modification of its properties, quality, and value.

At the end of this course students should have acquired mastery of chemical and physical-chemical techniques for the soil quality assessment.

The course aims to provide students with the knowledge related to the genesis, composition, classification of the soil, as well as its chemical properties, physical and chemical - physical, especially with regard to the exchange reactions and pH.

Some of the processes of transformation and degradation of the soil are also handled. Aspects related to fluid phases contained in soil and their properties are also provided.

Some exercises on sampling and laboratory analysis complete the educational process of this course.

PRE-REQUIREMENTS

Good knowledge of basic chemistry.

SYLLABUS

The inorganic solid phases

The lithology of soil

The crystalline and amorphous minerals

- Silicates, phyllosilicates, oxides, hydroxides
- other minerals of interest in soil

The organic phases of the soil

The organic matter

- organic constituents
- humification
- energy and environmental meaning
- extraction and fractionation
- chemical and chemical –physical properties

The phenomena of adsorption and exchange

Charges on the soil surfaces

- permanent charges
- pH dependent or variable charges

Retention and cation exchange

- the electrical double layer
 - qualitative aspects of the exchange (reversibility, stoichiometry, velocity, mass action , etc.).
 - selectivity of the exchange
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Retention of anionic and molecular compounds

- exchangeable anions
- adsorption of neutral or partially charged molecules

Equations of the exchange and adsorption isotherms.

Kinetics of soil release. Evaluation of the kinetic parameters.

pH and redox potential

The pH of the soil and its regulation

- acceptors and electron donors ;
- the redox in soil

Laboratory practices

Safety in the laboratory. Unit of measure. Accuracy, precision. Use of measuring instruments. Methods of soil sampling. Preparation of reagents. Determination of acid/ base and redox curves of a soil.

Complexometric titration of divalent ions. Determination of particle size distribution. Determination of pH and electrical conductivity of the liquid phase of the soil.

Determination of the cation exchange capacity and of the soil organic matter. Determination of the total carbonates and exchangeable calcium content.

TEACHING METHODS

Theoretical lessons, Classroom tutorials, Laboratory tutorials.

EVALUATION METHODS

Practical test, Oral examination, Written report.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

<https://www.dropbox.com/home/Soil%20Chemistry%202018-2019>

Nyle C. Brady: The Nature and Properties of Soils, Prentice Hall

George Stoops, author; M.J. Vepraskas, ed. Guidelines for Analysis and Description of Soil and Regolith Thin Sections.

Soil Science Society of America (SSSA), Madison (WI), USA

INTERACTION WITH STUDENTS

Week Day	Time	Place
MONDAY	15-17	Teacher room
TUESDAY	15-17	Teacher room
WEDNESDAY	11-13	Teacher room
THURSDAY	11-13	Teacher room
FRIDAY	11-13	Teacher room

EXAMINATION SESSIONS (FORECAST)¹

Month (2019)	Day	Hour
February	5	11:00
March	5	11:00
June	4	11:00
July	9	11:00
September	10	11:00
October	8	11:00
December	5	11:00

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

Student should attend the lectures given during this course to be permitted to access to laboratory exercises. Students will report on the results obtained in the tested laboratory practices

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