

COURSE: **Chemistry of fertilizers and pesticides (AGR0039)**

ACADEMIC YEAR: 2018/2019

TYPE OF EDUCATIONAL ACTIVITY:

TEACHER: Prof. ANTONIO SCOPA

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mobile (optional):

Language: Italian

ECTS: (7 of lessons and 1 of laboratory/practice)	n. of hours: (56 of lessons and 16 of labs/practice)	Campus: Potenza School: SAFE Program: Bachelor in Agricultural Science and technology	Semester: I
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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course aims to provide students with theoretical and practical knowledge on chemical and biological aspects of the soil-plant system. The aim is to provide knowledge about the regulations and the use of fertilizers and on the use and recycling of agro-forestry biomass. In addition, it aims to provide the knowledge on use classification, and about the main biotic and abiotic transformation processes of xenobiotic molecules in the interface soil-plant-atmosphere. Students can work independently on particular topics and to make a contribute, in terms of communication to the other students. Theoretical part is followed by laboratory tests and numerical exercises.

- **Knowledge and understanding:** knowledge and ability to understand the general principles that regulate, qualitatively and quantitatively, soil exchange of elements utilized for the development of the plant; Knowledge and ability to understand physical and chemical phases of the soil nutrients; Knowledge and ability to understand the role and importance of organic matter and fertilizer elements; Knowledge and ability to understand the functions and destiny of xenobiotic elements in degradative processes.
- **Applying knowledge and understanding skills:** ability to interpret phenomena and transformations of nutrients in soils; Ability to identify the main physical and chemical properties of fertilizers and pesticides; Ability to treat model program for study the dispersants of pollutants in soil.
- **Ability to choose and judge (autonomy of judgment):** ability to build pathways to identify the main relationships between macroscopic and microscopic soil-fertilizer-pesticide properties; Ability to predict the major degradative pathways and differences in the transformation of the classes of organic compounds present in or added to the telluric matrix.
- **Communication skills:** ability to organize in a logical way and to communicate, using an appropriate and correct language and mathematical and graphical tools as well, the acquired knowledge.
- **Learning skills:** ability to collect and organize in a functional way the information coming from class lectures, suggested books, and literature data.

#### PRE-REQUIREMENTS

To understand the material presented in this course are needed thorough knowledges of General Chemistry, Organic Chemistry, Physics, Agricultural Chemistry, Microbiology and Plant Physiology.

#### SYLLABUS (CFU units in bold)

##### **Elements of plant nutrition (1 CFU lesson)**

Chemical forms and redox states. Biochemical cycle and bio-availability for the plants of: macro elements (N, P, K), meso elements (Ca, Mg and S) and micro-elements (B, Cu, Fe, Mn, Mo, Zn)

##### **Availability and uptake of nutrients (1 CFU lesson)**

Plant-root kinetic environment, kinetics of nutrient release, maximum amount available

##### **Fertilization (1 CFU lesson)**

Organic matter and soil microbial biomass: evolution of organic matter, contributions and consumption. Recycling of organic waste products: sources, stabilization treatments, use. Fertilizers: types, chemical characteristics, behavior in soil. Italian and EU regulations

##### **Properties and classification of crop protection products (1 CFU lesson)**

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Chemical classification, modes of action, formulations, methods of use and treatments

**Transformation and degradation of xenobiotic molecules (1 CFU lesson)**

Adsorption and desorption in soil, transformation and degradation of biotic and abiotic, environmental distribution, environmental remediation processes

**Toxicity of xenobiotics (1 CFU lesson)**

Translocation of agrochemicals in plant and mechanisms of action, the main functional pathways and cellular metabolism

**Toxicity of xenobiotics (1 CFU lesson)**

Translocation of agricultural chemicals in living organisms, main effects, functional pathways and cellular metabolism

**Laboratory Experiences (1 CFU lesson)**

Sampling Methods of water and fertilizers. Instrumental analytical methods for the determination of the chemical-physical characteristics of fertilizers and water. Determinations of phosphorus and nitrogen. Kinetics of nutrient release. Determination of pesticide residues and/or metabolites.

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**TEACHING METHODS**

Theoretical lessons, Laboratory and numerical tutorials. The topics of the course will be treated with the help of Power Point presentations, both for lectures and for the laboratory exercises.

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**EVALUATION METHODS**

Oral examination to verify the learning of teaching. The objective is to find the level of achievement of the previously mentioned educational goals and discussed in the lectures. To the student will be placed four basic question.

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**TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL**

Skoog Douglas A. – West Donald M., Chimica analitica. Una introduzione, Edises Napoli

AAVV – Norme per la disciplina dei fertilizzanti, Arvan Ed. Venezia

Muccinelli – Prontuario degli Agrofarmaci

Lesson notes.

In relation to the contents of the course will be specified the parts to be explored.

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**INTERACTION WITH STUDENTS**

At the beginning of the course, after describing the objectives, program and methods of verification, the teacher collects the list of students accompanied by name and email.

The teacher receives from Monday to Friday from 9.00 to 11.00 and he is available at all times for a contact with the students, through its e-mail or telephone.

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

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**EVALUATION BOARD**

Prof. Antonio SCOPA (member, president)

Prof. Sabino Aurelio BUFO (member)

Prof. Piergiorgio GHERBIN (additional member)

Dr.ssa Laura SCRANO (additional member)

Dr.ssa Maria NUZZACI (additional member)

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**SEMINARS BY EXTERNAL EXPERTS**      YES

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