COURSE DETAILS

"PRINCIPLES OF AGRICULTRURAL CHEMISTRY AND BIOCHEMISTRY"

SSD AGR/13

* *In case of an integrated course, the SSD (scientific disciplinary sector) should be written above only if all modules of the course belong to the same SSD, otherwise the SSD is to be written alongside the MODULE (see below).*

DEGREE PROGRAMME: PRINCIPLES OF AGRICULTURAL CHEMISTRY AND BIOCHEMISTRY

ACADEMIC YEAR 2021-2022

GENERAL INFORMATION – TEACHER REFERENCES

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE):
MODULE (IF APPLICABLE):
CHANNEL (IF APPLICABLE):
YEAR OF THE DEGREE PROGRAMME (I, II, III): II
SEMESTER (I, II): I
CFU: 9

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "ORDINAMENTO")

General and inorganic chemistry, organic chemistry

PREREQUISITES (IF APPLICABLE)

The student who accesses this course is advised to have a good preparation of the fundamentals of mathematics, physics, chemistry, and plant biology. These prerequisites are provided by the basic courses delivered during the first year of the course.

LEARNING GOALS

The course aims to provide students with:
- the knowledge bases of the chemical, physico-chemical and biochemical properties of the mineral and organic components of the soilS that determine the behavior of nutrients and pollutants and influence their productivity;
- the basic knowledge and operational skills for understanding the main molecular and functional processes in plants (both at cellular and organism level), with particular reference to aspects relating to the complex soil-plant-atmosphere system.

In the laboratory, the student will transfer the basic theoretical notions to practical laboratory experiences, integrating and deepening some aspects of the subject to complete the training process.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The students must demonstrate knowledge of the theoretical foundations and knowing how to understand the problems relating to the chemical and biochemical aspects of the soil-plant system and the processes responsible for soil fertility. They must demonstrate that they know how to elaborate even complex discussions concerning the mineral and organic constituents of the soil that determine the behavior of the chemical species present (nutrients and pollutants) and influence their productivity.

Applying knowledge and understanding

The students must demonstrate to be able to identify, evaluate and propose adequate solutions to problems of fertility and soil degradation. They must be able to identify the main biochemical mechanisms underlying the metabolic processes of the plant linked to the production of chemical energy and the synthesis of the main biomolecules. They must also be able to frame the knowledge of agricultural chemistry and biochemistry in their relations with other scientific and technical disciplines.

COURSE CONTENT/SYLLABUS

1. The soil constituents - 2 CFU (Minerals and rocks. The processes of weathering of mineral components. The weathering products: clay minerals, oxides, and hydroxides. The organic matter: constitution, chemical composition, function and reactivity, humic substances);
2. The soil properties - 2 CFU (texture, structure, density, porosity, color. The soil pH. Problematic soils and corrections. Adsorption, cationic and anionic exchange);
3. The nutrient cycle in the soil-plant system - 1 CFU (macro and micronutrients);
4. The processes of soil degradation - 1 CFU;
5. Biomolecules - 1 CFU (water, carbohydrates, amino acids, proteins, nucleic acids, lipids);
6. Biochemistry of plant nutrition - 2 CFU (enzymes, glycolysis, Krebs cycle, oxidative phosphorylation, and photophosphorylation).

READINGS/BIBLIOGRAPHY

Handnotes based on lectures held in classroom and on in-depth focuses delivered through the web.
Recommended textbooks:
- Principles of Soil Chemistry 4th Edition, Kim H. Tan, CRC Press
- Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox, W H Freeman & Co

- OZ SOILS, An Interactive Introduction to Soil Science. D. Lockwood, Univ. of New England. Australia

TEACHING METHODS

The teacher will use a) lectures for about 60% of the total hours, b) numerical exercises to practically deepen theoretical aspects for 8 hours, c) laboratory to deepen the applied knowledge for 10 hours, d) seminars and / or excursions for study specific issues for 10 hours.
The teacher will make use of multimedia supports (eg JoVE educational videos), specialized software OzSoil, and material available on-line.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	
only written	
only oral	X
project discussion	
other	

In case of a written exam, questions refer to: (*)	**Multiple choice answers**	
	Open answers	
	Numerical exercises	

(*) multiple options are possible

b) Evaluation pattern:

[this field needs to be filled in only when there are different weights among written and oral exams, or among modules if this refers to an integrated course]