

COURSE OF STUDY Science and Technologies of the territory and the agro-forestry environment (STAF)

ACADEMIC YEAR 2023/2024

ACADEMIC SUBJECT Pedology

General information	
Year of the course	<i>Second</i>
Academic calendar (starting and ending date)	<i>From September 25, 2023, to January 19, 2024 – pause from November 13 to November 24, 2023, for midterm exam</i>
Credits (CFU/ETCS):	<i>Three</i>
SSD	<i>AGR 14</i>
Language	<i>Italian</i>
Mode of attendance	<i>Not compulsory</i>

Professor/ Lecturer	
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Department and address	<i>DISSPA, Agricultural Chemistry and Biochemistry section, Room #5, first floor</i>
Virtual room	<i>Microsoft teams, Zoom or other apps</i>
Office Hours (and modalities: e.g., by appointment, on line, etc.)	<i>Tutoring hours can be every day, in-person or online, by appointment request.</i>

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<i>75</i>	<i>16</i>	<i>14</i>	<i>45</i>
CFU/ETCS			
<i>3</i>	<i>2</i>	<i>1</i>	

Learning Objectives	<i>The course aims to provide knowledge and insights useful for understanding the origin and evolution of soils. Topics of pedology will be covered, such as pedogenesis and soil evolution, soil profile and classification.</i>
Course prerequisites	<i>Preliminary knowledge of inorganic chemistry is required.</i>

Teaching strategies	<i>The lectures will be provided with several examples and illustrations by means of PowerPoint presentations, movies, practical drills in the classroom and laboratory</i>
Expected learning outcomes in terms of	
Knowledge and understanding on:	<ul style="list-style-type: none"> <i>Knowledge of the basic information about general pedology and soil classification systems</i>
Applying knowledge and understanding on:	<ul style="list-style-type: none"> <i>Knowledge and understanding of the origin and evolution of soils for the best synergy with vegetation</i>
Soft skills	<i>Making informed judgements and choices</i> <ul style="list-style-type: none"> <i>Provide reasonable hypotheses regarding the detection of anomalous soil conditions and their restoration for the best synergy with vegetation.</i>

	<p><i>Communicating knowledge and understanding</i></p> <ul style="list-style-type: none"> ○ Ability to express oneself in clear and scientifically rigorous language <p><i>Capacities to continue learning</i></p> <ul style="list-style-type: none"> ○ Ability of updating the knowledge about the pedology in the considered context
Syllabus	
Content knowledge	<p><i>Pedogenesis: from rocks to the soils. The key factors of soil formation: the parent material (rock), the climate, the relief (topography), the microorganisms (biomass), the time, the anthropic factor. Jenny's equation.</i></p> <p><i>The lithological factor: the mother rock. Stability/alterability of primary minerals and factors affecting it: Order of solidification of primary minerals, silicate structure, isomorphous substitution and decompensation charge, presence of oxidable ions. The transformation of primary minerals into secondary ones (of new formation). Theory of disintegration-recombination. Theory of differential migration of ions. Thermodynamic and kinetic aspects. Chemical potential of the ion. Crystalline and amorphous minerals in soil: oxyhydroxides, phyllosilicates, allophane, carbonates, gypsum, evaporites. Examples of reactions. Stability diagrams of minerals. Levels and an evaluation of the evolution of soils.</i></p> <p><i>Main rocks and primary minerals: nomenclature and composition. Disposition and packing of the ions in space. Ionic radius and cation/anion ionic ray ratio. Elementary cell. Crystal lattice. Crystal systems and Bravais lattices.</i></p> <p><i>Silicates: geometric structures and major chemical characteristics. Exercises.</i></p> <p><i>The climate factor: climatic agents. Role of liquid water and vapor, oxygen, carbon dioxide, biomass, wind, ice, heat, temperature.</i></p> <p><i>The organic and topographical factors.</i></p> <p><i>The time factor: times of formation and evolution of soils.</i></p> <p><i>Processes of pedogenesis: physical, chemical and biological processes.</i></p> <p><i>Fragmentation and disaggregation, chemical and biological decomposition.</i></p> <p><i>The evolutionary processes of soils: decarbonation, leaching, podzolization, ferrallitization, salinization, sodicization, gleyfication.</i></p> <p><i>The pedon. Profile, soil horizons and sub-horizons. Diagnostic and genetic horizons. Autochthonous and allochthonous soils. Zonal, intrazonal and azonal soils. Macroclimate-soil relationships. Examples of description of the soil profile. Soil classification. Historical classifications (Dokoutchaev and Baldwin). FAO-UNESCO and USDA classifications. Italian classification. Exercises for comparing classifications.</i></p> <p><i>Drills:</i></p> <p><i>Soil sampling and rapid field analysis. Soil sampling for pedological purposes. Methods of sampling, collection and preparation of the soil sample for laboratory analyzes.</i></p>
Texts and readings	<ul style="list-style-type: none"> ● <i>Soil Genesis and Classification. Buol, S.W., Southard, R.J., Graham, R.C. and McDaniel, P.A. (2011).</i> ● <i>Metodi Ufficiali di Analisi Chimica del suolo, Roma, 1999.</i>
Notes, additional materials	<i>Students could get a copy of all presentations from the lecturer</i>
Repository	<i>Microsoft teams virtual class</i>
Assessment	
Assessment methods	<p><i>Only the students enrolled in the academic year during which this module is offered, can have an intermediary exam during the teaching period of module. The result of this intermediary exam remains valid for the whole academic year and concurs to the final evaluation of the student.</i></p>

	<p><i>The intermediary exam will be given on the subjects treated during the lessons and the practical activities as reported in the Didactic Regulation in Agricultural Science and Technology (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period. The evaluation of the intermediary exam is expressed in thirtieths.</i></p> <p><i>At the end of the module teaching period, the students who passed positively the intermediary exam, can give the final exam concerning on the subjects treated during the lessons and the practical activities since the intermediary exam, as reported in the Didactic Regulation in Agricultural Science and Technology (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period. Students who did not pass or give the intermediary exam will be examined on the whole subjects treated during the lessons and the practical activities as reported in the Didactic Regulation in Agricultural Science and Technology (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period. The intermediary and the final exams consist of an oral examination. The evaluation of the student is based on criteria previously fixed such as reported in the Annex A of the Didactic Regulation in Agricultural Science and Technology. The exam for foreign students can be given in English according to the above reported modalities.</i></p>
Assessment criteria	<p><i>Knowledge and understanding</i></p> <ul style="list-style-type: none"> ○ The student will get the knowledge on the origin and evolution of soils in the agro-forest systems. <p><i>Applying knowledge and understanding</i></p> <ul style="list-style-type: none"> ○ Knowledge and understanding of the origin and evolution of soils for the best synergy with the vegetation. <p><i>Making informed judgements and choices</i></p> <ul style="list-style-type: none"> ○ Provide reasonable hypotheses regarding the detection of anomalous soil conditions and remediation operations needed for their restoration. <p><i>Communicating knowledge and understanding</i></p> <ul style="list-style-type: none"> ○ Ability of describing the aspects that characterize the pedology of soils. <p><i>Capacities to continue learning</i></p> <ul style="list-style-type: none"> ○ Ability of updating the knowledge about the pedology in the considered context <p>The results of the expected learning, in term of knowledge and ability, are listed in the Annex A of the Didactic Regulation of the Bachelor Degree Course (expressed by the European descriptors of the study title).</p>
Final exam and grading criteria	<p><i>The final grade is given in thirtieths. The exam is considered passed when the grade is greater than or equal to 18.</i></p>
Further information	