



# UNIVERSITÀ DEGLI STUDI DI PALERMO

Department: Agricultural, Food and Forestry Science

A.Y. 2023/2024

## DEGREE COURSE IN – SCIENCE AND TECHNOLOGIES FOR SOIL PROTECTION AND CONSERVATION

- SCIENCES AND TECHNOLOGIES FOR SOIL PROTECTION AND CONSERVATION -

### Characteristics



Class of Master's Degree  
(MSc) on Agricultural  
sciences (LM-69)



2 YEARS



PALERMO



FREE ACCESS



2294

### Educational objectives

The STEDIS course aims at deeply investigate the cultural, scientific and professional fields related to the safeguarding, protection and sustainable management of the soil as a complex, dynamic, multi-phase and multi-elemental ecosystem that exchanges energy and materials with the external environment.

The Course provides the understanding of the interactions between the different phases (solid, liquid and gaseous) of the soil, the study of the chemical elements present and their relationships with the vegetal component and the lower atmosphere. In particular, the study of the relationships governs the formation of outflows, erosion processes at different spatial scales and the consequent degradation processes (sedimentation, sodicization, salinization, eutrophication of water bodies, loss of fertility, diffuse pollution of agricultural origin).

The scientific fields characterizing the LM-69 STEDIS educational project refer to the disciplines of fertility and soil conservation, production, agricultural engineering, as well as the economic-management area. Furthermore, the project is completed with the acquisition of topics and knowledge in related fields such as applied botany, forestry, geomorphology, legislation and environmental assessment.

The skills that students can acquire are based on the acquisition of the most innovative technical-scientific knowledge of the disciplines of surveying and territorial information systems, applied botany, soil conservation and protection, hydrology, and the physical quality of soils. These skills are completed by the topics of geomorphological hazards, environmental legislation and related evaluation techniques, soil microbiology, agronomic techniques, and the choice of wood species for soil conservation as well as for forest fire prevention and protection. The complex of these disciplines, which underlie the implementation of soil defence, conservation and sustainable management techniques, can be completed with elective teachings, enriching skills and abilities in the fields of biotechnics of plant species and naturalistic engineering also with reference to the degradation of wooden materials, bioindicators of soil quality and the recovery of degraded areas.

All the teachings provide the achievement of specific skills, through laboratory and field exercise (from a minimum of 1 to a maximum of 3. Students acquire skills related to the use of survey techniques and information systems for the representation of the territory, the identification and survey of vegetation typologies, the interpretation of the results of the analyses on a soil sample and the relative certification, the use of field and laboratory for the hydrological characterization of soils, the application of soil survey methodologies and land evaluation systems, the treatment and microbiological analysis of soil samples, the use of models for estimating soil loss at different spatial scales, the recognition of rocks and field geomorphological survey techniques, the recognition of herbaceous and woody species for soil protection interventions, the drafting of exemplary cases of environmental impact assessment and strategic environmental assessment.

The educational path includes 10 curricular teachings, with 50% integrated courses including a maximum of 2 modules. Each teaching includes lectures, with a student workload of 8 hours for each credit, and a variable number of credits (1-3) for exercises, laboratory activities and technical visits. For the latter activities, 1 credit corresponds to 12 hours of assisted teaching activity.

The training course is divided into three learning areas, called Territorial survey, Soil system analysis and monitoring and Design and management of soil defence and conservation interventions.

The teachings in the Territorial survey area are: Territorial Survey and Information Systems, Botany applied to soil protection and Soil surveying and evaluation.

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The objective of Territorial Survey and Information Systems is to provide students with the methods to use and process satellite data, with the necessary skills and abilities to use GPS and terrestrial and aerial photogrammetry, as well as the knowledge and applications of SIT also in the organization of the work of a public or private body.

Botany applied to soil protection will provide students with the knowledge and cognitive and methodological tools for the description and analysis of the physical, biological, and anthropic heterogeneity and complexity of the landscape, as well as for the management of ecosystems at different scales of reference. Finally, Soil Surveying and Evaluation aims at providing students with the methods and technologies necessary for the elaboration of soil and thematic maps and for their application to soil evaluation techniques.

The second learning area, Analysis and monitoring of the soil system includes the teachings: Soil conservation and protection, Hydrology and physical quality of soils with laboratory and Soil microbiology with laboratory.

The teaching Soil conservation and protection provides the theoretical foundations for an advanced knowledge of soil alteration processes as well as the advanced methodological technologies and tools to be adopted for soil conservation and protection.

Hydrology and physical quality of soils provides students with the specialized knowledge necessary for the sustainable management of agricultural soil with particular reference to the fundamental hydrological processes involving the transport of water and solutes in the rhizosphere, as well as with the techniques for measuring the physical and hydraulic characteristics of the soil with particular reference to the assessment of physical quality. The learning area is completed with the microbiological characterization of the soils aimed at monitoring the degradation processes and identifying intervention solutions.

The third learning area "Design and management of soil defence and conservation interventions" includes the teachings: Soil erosion and geomorphological hazard, Agronomic techniques for soil conservation, Fire prevention and protection techniques and Legislation and evaluation of interventions.

The Geomorphological Hazard module addresses the study of relief forms and the analysis of causes and factors underlying their genesis, development and evolution and integrates the teaching of Soil erosion and geomorphological hazard, which provides students with the essential elements for the interpretation and mathematical simulation of the erosive processes at different spatial scales (plot, slope of the catchment area), the evaluation of the production of sediments and the silting of reservoirs, the design and implementation of soil conservation and evaluation of the effects of fires on erosion processes. Soil conservation agronomic techniques provide students with the scientific and technical knowledge necessary to plan and organize crop sequences, technical itineraries and rational management models of Mediterranean herbaceous agrosystems for anti-erosion and soil protection purposes and will be supplemented by knowledge of the morpho - functional characteristics of trees, from the technical ones of arboreal systems in hills and mountains to the silvicultural management techniques of forest ecosystems effective for fire prevention and for the restoration of areas affected by fire.

Lastly, this area aims to provide students with a framework of environmental law with particular reference to the issues of soil protection and hydrogeological instability as well as with the regulatory and operational tools necessary to formulate judgments of economic and financial convenience relating to investment projects in both public and private fields.

Learning is assessed through oral exams, with possible practical tests or discussion of papers, case studies and projects prepared during the lessons and exercises foreseen in the single course. The examination is always unique even in the case of an integrated course.

The two modules of the integrated course Territorial Survey and Information Systems belong to the same scientific sector and have common learning objectives, namely surveying with different techniques and managing spatial data, as well as similar evaluation methods, favouring the discussion of case studies and projects developed during the course.

The two modules of the integrated course Soil conservation and protection belong to the same scientific sector and are internally correlated by the study of soil alteration processes followed by protection techniques. The scientific language adopted and the teaching methods, in which the laboratory part is privileged, constitute the means to obtain full integration.

In the integrated course Legislation and evaluation of interventions.

the regulatory path in the field of environmental law and soil protection legislation is combined with the knowledge and skills in terms of evaluation of the consequent interventions for the prevention and mitigation of hydrogeological risk. The complementarity of the topics ensures the integration of knowledge and skills.

The integrated course Soil erosion and geomorphological hazard provides two different and complementary points of view (hydrological and geomorphological) of the erosion phenomena at the catchment area scale. The uniformity of the topics, the common scientific language and the typically applied teaching methodologies guarantee its complete integration.

The integrated course Fire prevention and protection techniques provides complementary knowledge on wood species and on the evaluation of the effects of fires on the soil-vegetation system. The two disciplinary sectors, belonging provide complementary skills with similar teaching methodologies.

## **Professional opportunities**

Profile:

Soil protection technician

Functions:

The Soil Protection Technician is a professional capable of responding to both the needs of public bodies and those of the world of business and the free profession whose objective is to defend the soil from natural and anthropic phenomena that alter the physical, chemical and biological characteristics, such as erosion, salinization, sodicization, organic and inorganic contamination, sediment production. In particular, the Soil Protection Technician i) designs integrated territorial information

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systems using remotely detected data (drones, satellites), ii) designs soil conservation interventions on a slope and catchment area scale, iii) applies the knowledge acquired on the fundamental hydrological processes and on the techniques for measuring the reference parameters, and iv) formulates judgments of economic and financial convenience of the interventions. The student can enroll in section A of the Professional Register of Doctors of Agronomy and Doctors of Forestry.

Skills:

The Soil Protection Technician carries out planning, design, management, control, coordination and training tasks in all those structures, both public and private, which operate in the soil protection and conservation and redevelopment sectors. soil ecosystem.

Outlets:

The Soil Protection Technician has a professional profile that allows him to find a job placement, subject to public competition, in various state structures and apparatuses, such as the State Forestry Corps, or in the Regions, Provinces, Mountain Communities, Municipalities, Park Authorities, Nature Reserves, Agricultural Engineering Companies and in Companies and Organizations operating in the field of soil defense and conservation. The soil defense technician can also collaborate in the activities of environmental associations also with reference to the sector of environmental dissemination; another relevant professional outlet is that of freelance activity, as the graduate in "Sciences and Technologies for the defense and conservation of the soil" can access the Professional Register of Doctors of Agronomy and Forestry.

Profile:

Technician for sustainable soil management

Functions:

The Soil Management Technician is a professional capable of responding to the needs of public bodies as well as to those of the world of business and of private practice whose objective is to maintain or improve the fertility of the soil, carry out interventions soil conservation to limit the off-site effects of transported sediments and related nutrients, mitigate the effects resulting from soil degradation processes, through the application of agronomic, chemical, pedological, hydraulic techniques. In particular, the Sustainable Soil Management Technician i) plans sustainable soil management through the adoption of the most suitable technologies; ii) implements correct management of the soil resource in the agro-forestry and non-agricultural fields for the defence and conservation of the soil; iii) prepares the necessary processing for the design of agronomic strategies for soil conservation, iv) evaluates the pedo-climatic suitability and the water and nutritional needs of the main woody plants, v) formulates judgments of economic and financial convenience of projects intervention in the public and private fields.

Graduates can enrol in section A of the Professional Register of Doctors of Agronomy and Doctors of Forestry.

Skills:

The Sustainable Soil Management Technician carries out planning, design, management, control, coordination and training activities in all the public and private facilities operating in the sectors of sustainable soil management and conservation and requalification of the soil ecosystem.

Professional opportunities:

The Sustainable Soil Management Technician professional profile enables him/her to find a job placement, subject to public competition, in various state facilities and organisations, such as the State Forestry Corps, or in the Regions, Provinces, Mountain Communities, Municipalities, Park Authorities, Nature Reserves, Agricultural Engineering Companies and in Companies and Organizations operating in the sector of soil management and conservation. The Sustainable Soil Management Technician can also collaborate in the activities of environmental associations also with reference to environmental dissemination; graduates may also carry out freelance activity, after their enrolment in the Professional Register of Doctors of Agronomy and Forestry.

#### Final examination features

The final test has the objective of assessing the level of maturity and critical skills of the undergraduate, with respect to learning and to the acquired knowledge, on completion of the activities provided by the course syllabus. The final examination consists of the presentation of an original dissertation, aiming at assessing the level of technical-scientific and professional skills, as well as of the discussion of questions posed by the members of the Coard. The final dissertation may be of experimental, theoretical, design type, or an essay on a single or multi-disciplinary topic. In specific disciplines, the dissertation may also envisage a multimedia product. The dissertation may be written in a European Union language, other than Italian. The preparation for the final dissertation, or part of it, may be carried out at other Italian or foreign public and/or private institutions and companies, accredited by the University of Palermo.

Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
22818 - APPLIED BOTANY FOR SOIL PROTECTION <i>Di Gristina(RD)</i>	6	1	V	BIO/02	C
22939 - HYDROLOGY AND PHYSICAL QUALITY OF SOILS WITH LABORATORY <i>Bagarello(PO)</i>	6	1	V	AGR/08	B
22906 - REGULATIONS AND INTERVENTIONS EVALUATION - INTEGRATED COURSE <i>- ENVIRONMENTAL EVALUATION TECHNIQUES Asciuto(PA)</i>	6	1	V		
	3	1		AGR/01	C

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Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
- PRINCIPLES OF ENVIRONMENTAL LAW <i>Torta(RD)</i>	3	1		IUS/10	C
22904 - SOIL CONSERVATION AND PROTECTION - INTEGRATED COURSE	9	1	V		
- SOIL ALTERATION PROCESSES <i>Laudicina(PO)</i>	3	1		AGR/13	B
- TECHNOLOGIES FOR SOIL CONSERVATION AND PROTECTION <i>Conte(PO)</i>	6	1		AGR/13	B
04677 - ENGLISH LANGUAGE	4	1	G		F
22899 - PEDOLOGIC SURVEY AND SOIL EVALUATION <i>Lo Papa(PA)</i>	6	2	V	AGR/14	B
22820 - REMOTE SENSING AND TERRITORIAL INFORMATION SYSTEMS - INTEGRATED COURSE	9	2	V		
- LAND SURVEY <i>Palmeri(RD)</i>	3	2		AGR/10	C
- REMOTE SENSING AND TERRITORIAL INFORMATION SYSTEMS <i>Di Stefano(PO)</i>	6	2		AGR/10	B
22903 - SOIL EROSION OAND GEOMORPHOLOGICAL DANGER - INTEGRATED COURSE	9	2	V		
- GEOMORPHOLOGICAL DANGER <i>Di Maggio(PA)</i>	3	2		GEO/04	C
- SOIL EROSION AND CONSERVATION <i>Ferro(PO)</i>	6	2		AGR/08	B
22901 - SOIL MICROBIOLOGY WITH LABORATORY <i>Settanni(PO)</i>	6	2	V	AGR/16	B

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Subjects 2 ° year	CFU	Sem.	Val.	SSD	TAF
13916 - AGRONOMIC SOIL CONSERVATION TECHNIQUES <i>Di Miceli(PA)</i>	6	1	V	AGR/02	B
22835 - FIRE PREVENTION AND PROTECTION TECHNIQUES - INTEGRATED COURSE	6	1	V		
- FIRE PREVENTION AND RESTORATION OF FIRE AREAS <i>La Mela Veca(PA)</i>	3	1		AGR/05	C
- WOOD SPECIES FOR THE MEDITERRAEAN ENVIRONMENT <i>Lo Bianco(PO)</i>	3	1		AGR/03	C
20983 - DEGREE DISSERTATION	20	2	G		E
14184 - INTERNSHIP	12	2	G		S
Free subjects (suggested)	15				D

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### OPTIONAL SUBJECTS

Free subjects (suggested)	CFU	Sem.	Val.	SSD	TAF
11546 - VEGETAL SPECIES BIOTECHNICS <i>Domina(PA)</i>	3	1	V	BIO/03	D
22902 - FAUNAL BIOINDICATORS OF SOIL QUALITY <i>Lo Verde(PA)</i>	3	2	V	AGR/11	D
05909 - HYDRAULIC PROTECTION OF LAND <i>Pampalone(PA)</i>	3	1	V	AGR/08	D

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Free subjects (suggested)	CFU	Sem.	Val.	SSD	TAF
11561 - NATURALISTIC ENGINEERING TECHNIQUES <i>Ferro(PO)</i>	3	2	V	AGR/08	D
18472 - RECOVERY OF DEGRADED AREAS <i>Conte(PO)</i>	3	1	V	AGR/13	D
20536 - SOIL ECO-SYSTEMIC SERVICES <i>Lo Papa(PA)</i>	3	2	V	AGR/14	D
22833 - WOODEN MATERIALS DEGRADATION <i>Torta(RU)</i>	3	1	V	AGR/12	D

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