DEPARTMENT	Scienze Agrarie e Forestali
ACADEMIC YEAR	2014-2015
DEGREE COURSE	**MSc SCIENZE FORESTALI ED AMBIENTALI**
COURSE	Soil Quality
ARRANGEMENT INTO MODULES	YES
NUMBER OF MODULES	TWO
SCIENTIFIC GROUP	AGR/14 (1st Module), AGR/13 (2nd Module)
TEACHERS	1st Module: Dr Giuseppe Lo Papa, Researcher, University of Palermo 2nd Module: Dr Vito Armando Laudicina, Researcher, University of Palermo
NUMBER OF CREDITS	9
NUMBER OF HOURS NECESSARY TO ACHIEVE FULL LEARNING	135
NUMBER OF TEACHING HOURS	90
EXAMS TO PASS BEFORE	-
YEAR OF THE COURSE	1st
LOCATION OF THE COURSE	Indicated in the Class schedule
COURSE ARRANGEMENT	Lectures, Practical exercises, Technical visits (according to economic resources availability)
ATTENDANCE	Recommended
EVALUATION METHOD	One halfway test One practical test by the course end. Students will present results of the practical exercises assigned. Final exam.
RATING OF EXAMINATION	Mark ranging between 18 and 30
SEMESTER	2nd
CALENDAR OF EDUCATIONAL ACTIVITIES	According to the calendar published before beginning the course
STUDENTS RECEIVING	Dr Giuseppe Lo Papa Monday 9.00-11.00 (to be requested and confirmed by email) Dr Vito Armando Laudicina Wednesday 9.00-11.00

EXPECTED LEARNING OUTCOME

Knowledge and understanding skills

Acquisition of advanced tools and knowledge for soil/land evaluation. Acquisition of high-level knowhow for mapping soils and correctly interpreting soil maps and soil databases. Acquisition of specific and technical understanding in soil mapping and land evaluation. Knowhow acquisition about methodologies for the determination of bioindicators of soil quality. Understanding soil biological status for land evaluation and soil conservation.

Ability to apply knowledge and comprehension

Ability to understand and organize autonomously studies both on soil quality and correct management of soil resources in agriculture, forestry and other fields (such as engineering, urban, environmental, etc.).

Ability to judge

Ability to evaluate logics and results of sectorial studies on soil and land evaluation. Ability to evaluate findings from soil surveys performed in different contexts and wide ranges of environments and landscapes.

Ability to communicate

Ability to present results of soil evaluation studies/applications to heterogeneous audiences (scientists, technicians, farmers, policy makers, etc.).

Ability to interact and integrate with specialists in different disciplines.

Ability to highlight and support the importance of both studies on soil quality and land evaluation tools in any context.

Ability to learn

Ability in self-updating by reading of technical and scientific publications on topics of the soil science (especially

Pedology and Soil Biology), land evaluation, agriculture, forestry and environmental sciences. Acquiring skills and suitable language for pursuing further higher-level academic courses (i.e. Master, PhD) and for participating in seminars and qualifying courses on land/soil evaluation.

OBJECTIVES OF THE MODULE 1ST "LAND AND SOIL EVALUATION"

This module aims to provide knowledge and cutting-edge tools for students to understand and apply evaluation of both soils and land. It represents the natural continuation of the Module "Pedology". Starting from soil survey and mapping students will learn how to evaluate soils and landscape for agricultural, forest and environmental land planning. All the evaluation systems, methods and techniques will be taught. Over the course of the 60-hour lecturing, students will deal with practical exercises in classroom, laboratory and in field. The module will provide to acquire also basics on up-to-date topics in soil mapping and soil evaluation, such as data mining, inference systems, geostatistics, informatics. By means of in class discussion and written assignments, students will be challenged to develop and apply a specific evaluation system in an agricultural and/or forest study area by processing digital data in GIS environment.

Scheduled hours	TOPICS
2	INTRODUCTION: Potential and applications of soil surveys – Soil surveys for general and specific purposes.
8	BASICS OF CARTOGRAPHY AND REMOTE SENSING: Types of maps – Practical notions – aerial photos and satellite data – Applications of remote sensing in soil surveying.
10	FIELD ACTIVITIES IN SOIL SURVEY: Soil survey tasks: - preliminary studies – Soil landscape relationships – Soil variability – Developing a soil map legend – Soil Mapping – Soil survey in field – Soil map delineation - Coordination and quality control – Map units – Interpretation of soil surveys – Digital/Predictive soil mapping – Spatial analysis – Maps of soil properties.
4	SOIL MAP UNITS: Taxonomic units and map units - Guidelines for defining map units – Soil series, phases and variants – Associations, consociations and complexes – Soil map units in small-scale surveys.
4	MAP SCALE, ACCURACY, COSTS, BENEFITS: Map scale and survey intensity – Scale choices – Paradigms and limits in soil mapping – Soil variability assessment – Map scale, resolution and accuracy – Cost and benefits of soil survey/mapping – Cost-scale-accuracy relationships – Economic and social benefits of soil surveys
6	SOIL DATABASE AND SOIL INFORMATION SYSTEMS: Italian soil information system (ISIS) – NASIS, SSURGO, SPADE-2 – FAO Multilingual Soil Profile Database.
14	LAND AND SOIL EVALUATION: Land evaluation: principles and methods – parametric systems – Italian Soil Potential – Factorial multiplication methods – Methods with complex functions - Categorical systems - Land capability classification – how to apply Land capability - Land suitability classification - how to apply Land suitability classification – Fertility capability classification (FCC) – Ecological classification – Land/Soil evaluation for Forestry: Land capability classification for forestry – Woodland suitability – Soil potential –Soil evaluation and environmental protection - GIS and soil evaluation – Computerized and web-based Land/Soil Evaluation systems.
4	PRESENTING RESULTS: Final Report - Soil - Legend - Interpretation – Soil map report - Dissemination.
Practical applications 8	- FIELD EXCURSION for practical exercises in soil survey, mapping and evaluation. - Practical exercises in classroom and laboratory. - Application of evaluation systems by GIS (data and software will be provided by the Teacher)
Suggested books	- Dazzi C. 2005. Dispensa del corso di "Tecniche di Valutazione dei Suoli". In Italian. - Dent, D. & Young, A. 1991. Soil survey and land evaluation. London: George Allen & Unwin. - Rossiter D.G., 1994. Lecture Notes: Land Evaluation. SCAS Teaching Series No. T94-1 (http://www.itc.nl). - Further materials, notes, books and selected readings from a variety of sources will be assigned throughout the semester.

OBJECTIVES OF THE MODULE 2ND "BIOINDICATORS OF SOIL QUALITY"

Soil is introduced as living system, dynamic body and key factor of the biogeochemical cycles and environmental equilibria. The concept of soil quality is showed not as a given amount of soil nutrients linked to productive and

agronomic aspects, but as integration of physical, chemical and biological soil properties that concur to the maintenance and conservation of the soil resource. The expected results can be summarised in: a) to understand the soil as living and dynamic body; b) to acquire the know-how about the methodologies for the determination of the main bioindicators of soil quality; c) to understand that changes of the soil biological status is the first warning of soil degradation.

Scheduled hours	**TOPICS**
22	General concepts: physical and chemical soil properties. Definition of soil quality. Soil organic matter: composition, properties, energetic and environmental importance. Soil organisms. Microbial community. Microbial succession. Microbial quotient. Carbon and nitrogen mineralisation.The metabolic quotient. Soil enzymes: classification, location, origin, function and stability.
Practical applications 8	Principles and procedures of the methods used to investigate the following soil properties: 1. total organic carbon and total nitrogen; 2. microbial biomass carbon and nitrogen; 3. soil and microbial (heterotrophic) respiration; 4. potentially mineralisable nitrogen; 5. microbial community structure (phospholipids fatty acids).
Suggested books	- Killam, K. 1994. Soil Ecology. Cambridge University Press, Cambridge, U.K. pp. 242 - Notes released by the Teacher