UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	FORESTRY AND ENVIRONMENTAL SCIENCES
SUBJECT	MACHINES AND PLANTS FOR ENVIRONMENTAL PROTECTION
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	10517-A scelta dello studente
CODE	21173
SCIENTIFIC SECTOR(S)	AGR/09
HEAD PROFESSOR(S)	COMPARETTI ANTONIO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	3
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	MACHINES AND PLANTS FOR ENVIRONMENTAL PROTECTION - Corso: AGRICULTURAL ENGINEERING MACHINES AND PLANTS FOR ENVIRONMENTAL PROTECTION - Corso: AGROINGEGNERIA
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**COMPARETTI ANTONIO** Wednesday 11:00 13:00 Dipartimento Scienze Agrarie, Alimentari e Forestali, Edificio 4, Ingresso L, Ufficio n. 137

DOCENTE: Prof. ANTONIO COMPARETTI

PREREQUISITES	Basic physical quantities and practical aspects of measurements. Within-field soil and crop parameters.
LEARNING OUTCOMES	Knowledge and understanding capacity Knowledge and understanding of the technical and working characteristics and use methods of machines and plants for environmental protection. Acquisition of the basic technical and scientific knowledge and technical and economic selection criteria of machines and plants for environmental protection. Knowledge and capacity of using the language specific of machines and plants for environmental protection. Capacity of applying knowledge and understanding Capacity of applying the acquired knowledge to the identification of the optimal solutions for environmentally sustainable and effective interventions in agriculture and food industry. Capacity of indipendently selecting machines and plants for environmental protection, besides activities of technical support in these sectors. Opinion autonomy To obtain the capacity of finding data and identifying survey methods, in order to define solutions to the technical problems of agriculture and food industry. To obtain the capacity of critically assessing the issues and results of the planned interventions. To identify the problems and the related solutions aimed at reducing soil compaction, the used amounts of crop inputs and organic substrates conferred to landfills and, therefore, the environmental impact and production costs, in order to improve the environmental sustainability and efficiency, respectively, in agricultural farms and food processing plants. To be able to assess the selection problems, buying and management costs, reliability and working safety of the machines and plants for environmental protection. Communication skills Capacity of converting the technical and scientific language of the student in a didactic speech and, then, communicating with technicians of the same and different background, as well as describing the technical and working characteristics and use methods of machines and plants for environmental protection, in order to improve their efficiency and working capacity. To effectively communicate the theories and choices of the student to a not specialist audience, by transmitting the importance of the proposed choices. Capacity of converting the choices of the student in project papers. Capacity of explaining the types, characteristics, main parts, working, performance, management and basic evaluation and selection principles of machines and plants for environmental protection, also to an inexpert audience. Learning capacity Capacity of updating through the participation to technical and scientific seminars and/or the reading of scientific papers specific of this subject. Capacity of attending in-depth courses and specialised seminars, by using the knowledge obtained within the subject. Capacity of understanding the machines and plants for environmental protection, besides the newly acquired techniques and methods, developed in research fields.
ASSESSMENT METHODS	In order to achieve the credits related to the subject, the student must be able to examine the use of machines and plants for environmental protection, debate on their suitability for a large range of tasks and critically evaluate the viability of technological innovations for increasing the efficiency and reducing the environmental impact of agricultural and food systems. The exam candidate will have to answer to three oral questions, in agreement with the suggested references, about all the parts of the course contents: 1) soil physical-mechanical parameters or machines for traditional, minimum and zero soil tillage or interaction between the tyres/tracks of agricultural machines or working parts of agricultural tools and the soil physical-mechanical parameters (soil compaction); 2) within-field spatial and temporal variability or traditional agriculture and precision agriculture or precision agriculture cycle or sensors for the geo-referenced measurement of within-field soil parameters or spatially variable depth soil tillage; 3) Anaerobic Digestion plants for the conversion of organic substrates (plant biomass, agricultural wastes, animal husbandry manure and food industry by-products) into bioenergy (biogas) and biofertiliser (digestate). The final test is aimed at assessing if the student has knowledge and understanding of the topics, as well as has obtained interpretative competence and opinion autonomy of real cases. The threshold of pass mark will be achieved when the student shows at least general knowledge and understanding of the topics and minimum practical competences (machines for the conservative soil tillage and precision agriculture, Anaerobic Digestion plants), as far as the solution of real issues. He will have to show also explanatory and arguing capacities, in order to allow the transmission of his knowledge to the examiner. Below this threshold the exam result will be fail. Instead, the more the exam candidate succeeds in interacting with the examiner, by using his explanatory and arguing capacities, as well as

	the more his knowledge and practical capacities are concerned in detail with the subject of test, the more the assessment will be positive. The assessment is carried out according to a scale ranging from 18 to 30 with honours.
EDUCATIONAL OBJECTIVES	The education objectives of the subject are : - knowledge, capacities and competences on machines and plants for environmental protection, i.e. soil conservation, prevention or minimisation of soil compaction, reduction of crop inputs and spatially variable depth soil tillage, according to precision agriculture principles, as well as energy valorisation of organic substrates; - basic technical and scientific knowledge and technical and economic selection criteria of the machines and plants for environmental protection; - competences about the types, characteristics, main parts, working, performance, management and basic evaluation and selection principles of machines and plants for environmental protection.
TEACHING METHODS	Lectures and case studies.
SUGGESTED BIBLIOGRAPHY	Materiale didattico fornito dal docente sotto forma di presentazioni e pubblicazioni. Presentations and papers given by the teacher.

SYLLABUS

Hrs	Frontal teaching
1	Introduction to the course.
1	Soil physical-mechanical parameters.
5	Machines for traditional, minimum and zero soil tillage.
2	Machines for traditional, minimum and zero soil tillage (case studies).
2	Interaction between the tyres/tracks of agricultural machines or working parts of agricultural tools and the soil physical-mechanical parameters: soil compaction.
2	Sensors for the geo-referenced measurement of within-field soil parameters. Spatially variable depth soil tillage.
4	Within-field spatial and temporal variability. Traditional agriculture and precision agriculture. Precision agriculture cycle.
1	Low cost hand-held GPS mobile receiver.
4	Anaerobic Digestion plants for the conversion of organic substrates (plant biomass, agricultural wastes, animal husbandry manure and food industry by-products) into bioenergy (biogas) and biofertiliser (digestate).
2	Anaerobic Digestion plants for the conversion of organic substrates (plant biomass, agricultural wastes, animal husbandry manure and food industry by-products) into bioenergy (biogas) and biofertiliser (digestate) (case studies).