UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2023/2024
MASTER'S DEGREE (MSC)	AGROENGINEERING AND FORESTRY SCIENCES AND TECHNOLOGIES
SUBJECT	LABORATORY OF MECHANISATION FOR PRECISION AGRICULTURE
TYPE OF EDUCATIONAL ACTIVITY	F
AMBIT	21386-Altre conoscenze utili per l'inserimento nel mondo del lavoro
CODE	19646
SCIENTIFIC SECTOR(S)	
HEAD PROFESSOR(S)	COMPARETTI ANTONIO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	3
INDIVIDUAL STUDY (Hrs)	41
COURSE ACTIVITY (Hrs)	34
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Pass/Fail
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	Within-field soil and crop parameters. Agronomy. Tractors, agricultural implements and machines.
LEARNING OUTCOMES	Knowledge and understanding capacity Knowledge and understanding of machines, sensors, software, setting up/ control units and techniques for implementing precision agriculture. Acquisition of the basic technical and scientific knowledge about machines, sensors, software, setting up/control units and techniques for implementing precision agriculture, as well as the technical and economic criteria for selecting different types of those offered by the market. Knowledge and capacity of using the language specific of machines, sensors, software, setting up/control units and techniques for implementing precision agriculture. 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 precision agriculture. Capacity of independently selecting machines, sensors, software, setting up/ control units and techniques for implementing precision agriculture and activities of technical support in this sector. Opinion autonomy To obtain the capacity of finding data and identifying survey methods, in order to define solutions to the technical problems of precision agriculture. 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 the used amounts of crop inputs and, therefore, the environmental impact and crop production costs, in order to improve the environmental sustainability and efficiency, respectively, in agricultural farms. To be able to assess the problems of selection and the costs for buying machines, sensors, software, setting up/control units and techniques for implementing precision agriculture. Communication skills Capacity of converting the technical and scientific language of the student into a didactic speech and, then, communicating with technicians of the same and different background, as well as describing machines, sensors, software, setting up/control units and techniques for implementing precision agriculture. To effectively communicate the theories and choices of the student to a not specialised audience, by transmitting the importance of the proposed choices. Capacity of converting the choices of the student into project papers. Capacity of explaining machines, sensors, software, setting up/control units and techniques for implementing precision agriculture, as well as their basic principles of evaluation and selection, 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 laboratory. Capacity of understanding machines, sensors, software, setting up/control units and techniques for implementing precision agriculture, as well as the new developed research methods.
ASSESSMENT METHODS	The exam candidate will have to answer to 3 oral questions, in agreement with the suggested references, about all the parts of the course contents: 1) machines, sensors, software, setting up/control units and techniques for implementing precision agriculture; 2) exercise on the production of a yield or vegetative vigour or weed density map; 3) exercise on the production of a theoretical or actual fertiliser or herbicide spatially variable rate application map. The final test is aimed at assessing if the student has knowledge and understanding of the topics, as well as he/she has obtained interpretative competence and opinion autonomy on 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, sensors, software, setting up/control units and techniques for implementing precision agriculture), as far as the solution of real issues. He/she will have to show also explanatory and arguing capacities, in order to allow the transmission of his/her knowledge to the examiner. Below this threshold the exam result will be fail. The assessment result can be successfull or fail.
EDUCATIONAL OBJECTIVES	The education objectives of the laboratory are : - basic technical and scientific knowledge about machines, sensors, software, setting up/control units and techniques for implementing precision agriculture, as well as the technical and economic criteria for selecting different types of those offered by the market;

	- competences about machines, sensors, software, setting up/control units and techniques for implementing precision agriculture, as well as their basic principles of evaluation and selection.
TEACHING METHODS	Lectures, exercises and technical visits.
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 subject. Within-field spatial and temporal variability. Traditional agriculture and precision agriculture. Precision agriculture cycle.
1	Global Navigation Satellite Systems (GNSS): GPS, GLONASS and EGNOS.
1	Differential correction techniques: DGPS.
1	Proximal sensors for measuring within-field crop and soil parameters.
1	Remote sensing, from Unmanned Aerial Vahicles (UAVs) and satellites, of within-field crop and soil parameters.
1	Mapping of crop yield, vegetative vigour and weed density. Production of theoretical and actual fertiliser and herbicide spatially variable rate application maps.
1	Assisted guidance systems of agricultural machines.
1	Spatially variable rate fertiliser application. Fertiliser spreaders and setting up/control units for precision agriculture.
1	Spatially variable rate herbicide and pesticide application. Sprayers and setting up/control units for precision agriculture.
1	Decision Support Systems (DSS). Results achievable through precision agriculture implementation.

Hrs	Practice
1	Hand-held low cost GPS mobile receiver.
1	Geodetic GNSS mobile receiver.
1	Differential correction techniques: DGPS.
1	Criteria for selecting GNSS receivers.
1	GNSS planning.
3	Remote sensing, from UAVs and satellites, of within-field crop and soil parameters.
4	Mapping of crop yield, vegetative vigour and weed density. Production of theoretical and actual fertiliser and herbicide application maps.

Hrs	Others
4	Systems for the geo-referenced measurement of soil parameters (technical visit).
4	Remote sensing, from UAV, of within-field crop and soil parameters (within-field test).
4	Fertiliser spreaders and setting up/control units for precision agriculture (technical visit).