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	AGRO-ENERGIES
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	20758-A scelta dello studente
CODE	18466
SCIENTIFIC SECTOR(S)	AGR/02
HEAD PROFESSOR(S)	LETO CLAUDIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	3
INDIVIDUAL STUDY (Hrs)	43
COURSE ACTIVITY (Hrs)	32
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LETO CLAUDIO** Monday 09:00 11:00 Dipartimento di Scienze Agrarie, Alimentari e Forestali, Viale delle Scienze 13, Edificio 4, Ingresso L, Piano 2, Studio n. 24.

DOCENTE: Prof. CLAUDIO LETO

PREREQUISITES	The attendance of the course "Agrienergy" requires the knowledge of agronomy, herbaceous field crops, ioblogy and chemistry for the understanding of the main content and objectives of the course. The course provides no mandatory prerequisites, but the knowledge of some subjects is needed to understand the main technical and practical problems of the course and to provide rational solutions.
LEARNING OUTCOMES	a) Knowledge and understanding The course permits students to gain basic knowledge about agri-energy chains, considering the different forms of agri-energy to be used for business purposes: from the use of dedicated biomass and agricultural and forestry by-products to the use of solar and wind energy. The understanding of the main contents of the course requires a specific technical language of this course. b) Applying knowledge skill and understanding The main aim of the course is to encourage the students to develop project ideas and agri-energy models. The application of project ideas, particularly, should be achieved through a detailed analysis of the various business contexts and through an economic and technical evaluation of the most suitable and financially attractive agri-energy form for the selected farm. c) Making judgements The course requires students to be able to independently assess the most suitable forms of agri-energies for farms, especially from the point of view of environmental sustainability, in order to implement the agricultural and forest activities exploiting the scientific research. d) Communications The course requires that students have communication skills in order to transfer clearly information, project ideas and technical solutions to professionals, entrepreneurs, administrators and commentators. It requires that the dissemination activity is also carried out towards to a non-expert public. e) Lifelong learning skills The course requires that students are able to study issues of the course by consulting scientific literature, scientific publications and popular magazines. It requires, also, the ability to transfer the technical knowledge gained following the course or master, seminars and specific meetings, in business and professional sector.
ASSESSMENT METHODS	The course includes a final exam for the assessment of learning by an oral test. The oral test consists of an interview in order to check the skills and disciplinary knowledge provided by the course. Evaluation will be provided as a mark out of 30. The interview will include openended and semi-structured questions in order to verify the gained knowledge, the computing and presentation skills of the student. With regard to the evaluation of knowledge, students have to be able to make connections between the course contents. The evaluation of computing skills will be determined by the student's ability to provide independent judgments about the course contents, to understand the possible practical application of the course and to place the subject content within the target professional context. With regards to the evaluation of the computing capacities, a high quality of language will be required for the reference professional context. The highest score (30/30 with honours) will be awarded to the student who will prove to have a high capacity for judgment, a strong ability to put into practice the knowledge of the course through examples and/or models , a strong ability to provide solutions to the main problematic and to have a high quality the technical language. The lowest score (18/30) will be awarded to the student who will prove to have a low capacity for judgment, a poor ability to put into practice the knowledge of the course through examples and/or models, a poor ability to provide solutions to the main problematic and to have a low quality the technical language.In particular, the assessment method will be deemed insufficient in the event that the student demonstrates that he / she possesses an extremely lacking knowledge of the teaching topics and a poor ownership of the sectoral language. The evaluation score will increase proportionally and will reach intermediate levels between 18 and 30 with honours as the degree of knowledge demonstrated by the student on general and specific topics increases.
EDUCATIONAL OBJECTIVES	The aims of the "Agrienergy" course are to provide knowledge and specialized skills related to the use and management of the main forms of agri-energy to use within the farms. The understanding of the topics requires the knowledge of Agronomy, Herbaceous crops, Biology and Chemistry. The training will consist of frontal teaching and practices.
TEACHING METHODS	The course consists of frontal teaching and practices.
SUGGESTED BIBLIOGRAPHY	Testi di riferimento: a) Dell'Olio G. Agroenergie e biomassa. Dario Flaccovio editore, Palermo, Italia. ISBN: 9788857902029. b) Giardini L., Baldoni R. Coltivazioni erbacee. Volume "Piante oleifere, da zucchero, da fibra, orticole e aromatiche". Patron editore, Bologna, Italia. ISBN: 8855525417

	Letture consigliate: a) Articoli e pubblicazioni scientifiche inerenti gli argomenti dell'insegnamento Agrienergie.

SYLLABUS

Hrs	Frontal teaching
3	Presentation of the course. Agri-energetic context. Overview of the main agri-energies . Biodiesel, bioethanol, pure vegetative oils. Products and agricultural and forestry by-products for producing energy. Regulatory framework.
6	Herbaceous oilseed crops for energy production. Rapeseed, sunflower, safflower, Ehiopian mustard, linseed and other minor species of Brassica genus, Overview, cultivation techniques, production and technological aspects. Cases study and research project.
6	Herbaceous sugar crops for energy production. Sugarcane, sugar beet, sweet sorghum, topinambur. Agroindustrial residues for alcohol production. Overview, cultivation techniques, production and technological aspects.
4	Herbaceous crops for ligno-cellulosic biomass production. Giant reed, miscantus, sorghum. Overview, cultivation techniques, production and technological aspects. Pellet and agricultural pellet.
2	Biogas and biomethane. Production of dedicated biomass and residual. The digestate. Machines and plants for the processing of biomass for the production of biogas and biomethane in the farms. The biogas plants in Sicily.
1	A review of research on agrivoltaic systems. Perspectives of development in Sicily.

Hrs	Practice
4	Practices on agronomic management of energy crops. Crop models. Practices on the use of the main instruments for physical and energy characterization of samples of ligno-cellulosic plant biomass.

Hrs	Others
6	Technical-educational events to visit an experimental field of sugarcane and a agro-energy plant.