General Information	
Academic subject	**Integrated Course Applied engineering** **Module: Structure and Equipment for Protected Cultivations**
Degree course	**Plant Medicine**
Curriculum	
ECTS credits	**3 ECTs**
Compulsory attendance	**No**
Language	**Italian**

Subject teacher	Name Surname	Mail address	SSD
	Evelia SCHETTINI	**evelia.schettini@uniba.it**	**AGR/10**

ECTS credits details			
Basic teaching activities	**2 ECTs Lectures [L]**	**1 ECT Lab & field cl [L&Fcs])**	

Class schedule	
Period	I semester
Year	II year
Type of class	Lecture- workshops

Time management	
Hours	75 hours
In-class study hours	30 hours
Out-of-class study hours	45 hours

Academic calendar	
Class begins	30 settembre 2019
Class ends	17 gennaio 2020

Syllabus	
Prerequisites/requirements	Knowledge of principles of Mathematics Knowledge of principles of Physics: Principles of Heat Transmission.
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	*Knowledge and understanding* • Knowledge and understanding of structures and materials used for protected cultivation • Knowledge and understanding of technological equipment in support of protected cultivation • Understanding of the energy balance equation of a greenhouse *Applying knowledge and understanding* • Capacity to identify the most suitable structure and material in a protected

	environment depending on the cultivation period, the geographical area and the cultivated species • Capacity to identify the technical characteristics of the technological equipment according to the energy balance, the cultivation period, the geographical area and the cultivated species *Making informed judgements and choices* • Ability to plan an integrated sustainable design of a greenhouse in relation to the choice of structures, materials and equipment considering energy and production efficiency • Ability to analyze all possible environmental hazards that can be produced from all the productive activities within a protected cultivation • Ability to propose sustainable solutions to solve energy, environmental, and production problems *Communicating knowledge and understanding* • Ability to use informatics (drawing, simulation, graphic representation, and so on) *Capacities to continue learning* • Ability to continue learning by consulting books, papers and computerized catalogs. Expected learning outcomes in terms of knowledge and skills are listed in Annex A of the Study Guide Course Guidelines (expressed through the European Degree Program Title
Contents	• Principles and objectives of the course. • Fundamentals of Thermal Physics. Fundamentals of heat transmission: conduction, convection, radiation. • Solar radiation: UV, visible, near and far infrared. Climatic parameters. The greenhouse effect. • Greenhouse structures and construction. • Greenhouse classification and design characteristics. • Greenhouse energetic balance. • Greenhouse climate control systems: temperature, relative humidity. • Greenhouse cladding materials: glass, flexible and rigid plastics, screens, nets. • Computerized control and management systems. • Environmental and standardization aspects. • Environmental effects of greenhouses and mitigation methods.
Course program	
Bibliography	• Notes of the lectures and tables distributed during the course • Von Zabeltitz C (1999) Greenhouse structures. In: Stanhill G, Zvi Enoch H (eds) Greenhouse ecosystems. Ecosystems of the world, vol 20. Elsevier, Amsterdam, pp 17–69 • G. Vox, M. Teitel, A. Pardossi, A. Minuto, F. Tinivella, E. Schettini

	(2010) "Chapter 1: Sustainable Greenhouse Systems" in "Sustainable Agriculture: Technology, Planning and Management", Augusto Salazar e Ismael Rios Editors, **Nova Science Publishers**, Inc. NY USA, ISBN: 978-1-60876-269-9: 1-79. (https://www.novapublishers.com/catalog/product_info.php?products_id=17788)
Notes	
Teaching methods	
Assessment methods (indicate at least the type written, oral, other)	For students attending the course there will be a partial exam after the first part of the course. This partial exam consists of an oral test on the subjects developed during the hours of lecture and exercise. The outcome of this test contributes to the evaluation of the examination of profit and is valid for one academic year. The test is passed with a vote of at least 18/30. The exam consists of an oral exam on the topics developed during the course. The test is passed with a vote of at least 18/30. For students who have stood the first part of the exam, the final vote is expressed by the average of the votes obtained in the two oral tests. The oral examinations are public. The exam can be done in English
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are.	***Knowledge and understanding skills*** • Knowledge and understanding skills of the principles of heat transmission • Knowledge and understanding skills of the structures and construction materials used for protected crops • Knowledge and understanding skills of the energy balance equation • Knowledge and understanding skills of technological systems for air conditioning of greenhouses ***Knowledge and understanding skills applied*** • ability to apply the knowledge gained in solving problems related to a protected cultivation by identifying the structures, covering materials and technical characteristics of the technological equipment to ensure the microclimate required for the species cultivated according to the climate of the geographical area, the cultivation season, the plant species • ability to reduce environmental impacts mainly related to the risks of water / air pollution / soil related to the disposal of waste (plastic waste, etc.) ***Autonomy of judgment*** • Ability to propose sustainable solutions to solve energy, environmental and productive problems that may be encountered in protected habitats by ensuring appropriate welfare conditions for humans and plants • Ability to integrate knowledge gained in different areas

	Communicative Skills • Ability to communicate clearly and without ambiguity the knowledge and the ratio to specialists and non specialists • ***Ability to learn*** • Ability to learn and deepen in a self-directed and autonomous way
Further information	

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