



UNIVERSITÀ  
DEGLI STUDI DI BARI  
ALDO MORO

DIPARTIMENTO DI  
SCIENZE DEL SUOLO, DELLA  
PIANTA E DEGLI ALIMENTI

LAUREA MAGISTRALE IN  
MEDICINA DELLE PIANTE  
INTERNATIONAL JOINT MASTER DEGREE IN  
PLANT MEDICINE



General Information	
Academic subject	<b>Integrated Course Applied engineering Module: Structure and Equipment for Protected Cultivations</b>
Degree course	<b>Master's degree Plant Medicine (LM69)</b>
Curriculum	
ECTS credits	<b>3 ECTS (2 ECTS Lectures [L] and 1 ECT Lab &amp; field cl [L&amp;Fcs])</b>
Compulsory attendance	No
Language	Italian (English will be used when required for foreign students into didactic material)

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

ECTS credits details			
Basic teaching activities	<b>Engineering</b>		

Class schedule	
Period	First semester
Year	Second year
Type of class	Lectures, 2 ECTS (16 hours) Laboratory and field classroom, working groups, study case, and transferring of stakeholders' experiences 1 ECTS (14 hours) E-learning using public (eg Teams) and dedicated (Agripodcast) platforms can be used, on demand as learning facilities for students with disabilities and for working students, student athletes and students with babies

Time management	
Hours	75
In-class study hours	30 (16 Lectures + 14 Lab & field cl.)
Out-of-class study hours	45

Academic calendar	
Class begins	2020 September 28
Class ends	2021 January 22

Syllabus	



Prerequisites/requirements	<p>Knowledge of principles of Mathematics Knowledge of principles of Physics: Principles of Heat Transmission.</p>
Expected learning outcomes	<p><i>Knowledge and understanding on:</i></p> <ul style="list-style-type: none"> <li>• Knowledge and understanding on structures and materials used for protected cultivation</li> <li>• Knowledge and understanding on technological equipment in support of protected cultivation</li> <li>• Understanding on the energy balance equation of a greenhouse</li> </ul> <p><i>Applying knowledge and understanding on:</i></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> </ul> <p><i>Making informed judgments and choices:</i></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Ability to analyze all possible environmental hazards that can be produced from all the productive activities within a protected cultivation</li> <li>• Ability to propose sustainable solutions to solve energy, environmental, and production problems</li> </ul> <p><i>Communicating knowledge and understanding</i></p> <ul style="list-style-type: none"> <li>• Ability to use informatics (drawing, simulation, graphic representation, and so on)</li> </ul> <p><i>Capacities to continue learning</i></p> <ul style="list-style-type: none"> <li>• Ability to continue learning by consulting books, papers and computerized catalogs.</li> </ul> <p>Expected learning outcomes, as knowledge and ability, are reported in the annex A of the Didactic Regulation of the course Plant Medicine (expressed by European Descriptors)</p>
Contents	<ul style="list-style-type: none"> <li>• Principles and objectives of the course.</li> <li>• Fundamentals of Thermal Physics. Fundamentals of heat transmission: conduction, convection, radiation.</li> <li>• Solar radiation: UV, visible, near and far infrared. Climatic</li> </ul>



	<p>parameters. The greenhouse effect.</p> <ul style="list-style-type: none"> <li>• Greenhouse structures and construction.</li> <li>• Greenhouse classification and design characteristics.</li> <li>• Greenhouse energetic balance.</li> <li>• Greenhouse climate control systems: temperature, relative humidity, light, CO<sub>2</sub></li> <li>• Greenhouse cladding materials: glass, flexible and rigid plastics, screens, nets.</li> <li>• Soilless cultivation systems.</li> <li>• Computerized control and management systems.</li> <li>• Environmental and standardization aspects.</li> <li>• Environmental effects of greenhouses and mitigation methods.</li> </ul>
Course program	
Bibliography	<ul style="list-style-type: none"> <li>• Notes of the lectures and tables distributed during the course</li> <li>• 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</li> <li>• 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. (<a href="https://www.novapublishers.com/catalog/product_info.php?products_id=17788">https://www.novapublishers.com/catalog/product_info.php?products_id=17788</a>)</li> </ul>
Notes	None
Teaching methods	
Assessment methods	<p>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.</p> <p>The exam consists of an oral exam on the topics developed during the course.</p> <p>A minimum of 4 questions will be proposed to the student: one on the radiometric characteristics of covering materials for a protected cultivation, one on an air conditioning system, one on the energy balance equation, one on the innovative systems to be used for increasing environmental sustainability.</p> <p>The test is passed with a vote of at least 18/30.</p>



	<p>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.</p> <p>The oral examinations are public.</p>
<p>Evaluation criteria</p>	<p><i>Knowledge and understanding</i></p> <ul style="list-style-type: none"> <li>• Knowledge and understanding skills on the principles of heat transmission</li> <li>• Knowledge and understanding skills on the structures, construction materials and covering materials used for protected crops</li> <li>• Knowledge and understanding skills on the energy balance equation</li> <li>• Knowledge and understanding skills on technological systems for air conditioning of greenhouses</li> </ul> <p><i>Applying knowledge and understanding</i></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• ability to reduce environmental impacts mainly related to the risks of water / air pollution / soil related to the disposal of waste (plastic waste, etc.)</li> </ul> <p><i>Autonomy of judgment</i></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Ability to integrate knowledge gained in different areas</li> </ul> <p><i>Communicating knowledge and understanding</i></p> <ul style="list-style-type: none"> <li>• Ability to communicate clearly and without ambiguity the knowledge and the ratio to specialists and non specialists</li> </ul> <p><i>Communication skills</i></p> <ul style="list-style-type: none"> <li>• speaking, listening, reading and writing on protected cultivation identifying the structures, covering materials and technical characteristics of the technological equipment.</li> </ul>



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	<ul style="list-style-type: none"><li>techniques of evaluation and application, such as evaluating the relevance and quality of information.</li></ul> <p><i>Capacities to continue learning</i></p> <ul style="list-style-type: none"><li>Ability to learn and deepen in a self-directed and autonomous way</li></ul>
Further information	<p><b>Visiting hours</b></p> <p>Official visiting hours: Day and time are agreed according to an established appointment requested by phone or e-mail. Tutoring could be also on e-learning platforms.</p>