



General information	
Academic subject	Integrated Course Applied engineering Module: Structures and Equipment for Protected Cultivations
Degree course	Master degree Plant Medicine (LM69)
Academic Year	2022/2023 II year
European Credit Transfer and Accumulation System (ECTS)	3 ECTS
Language	Italian
Academic calendar (starting and ending date)	I semester (September 2022 – January 2023)
Attendance	Attendance is not mandatory but highly suggested

Professor/ Lecturer	
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Telephone	
Department and address	Dipartimento DICATECh Politecnico di Bari
Virtual headquarters	
Tutoring (time and day)	Tuesday, Wednesday and Thursday from 11.30am to 13.30; other days by appointment to be defined by email

Syllabus	
Learning Objectives	Sustainable design and management of structures, materials and equipment for greenhouse cultivations
Course prerequisites	Fundamentals of Mathematics Fundamentals of Thermodynamics
Contents	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 energy balance. Greenhouse climate control systems: temperature, relative humidity, light, CO₂. Greenhouse cladding materials: glass, flexible and rigid plastics, screens, nets. Soilless cultivation systems. Computerized control and management systems. Environmental and standardization aspects. Environmental effects of greenhouses and mitigation methods.
Books and bibliography	<ul style="list-style-type: none">○ Notes of the lectures on PDF format and tables distributed during the course○ Alpi A., Tognoni F. “Coltivazioni in serra” Edagricole, Bologna○ Tesi R. “Mezzi di protezione per l’ortoflorofrutticoltura e il vivaismo” Edagricole, Bologna○ Von Zabeltitz C. 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 “Chapter 1: Sustainable Greenhouse Systems” in “Sustainable Agriculture: Technology, Planning and Management”, Augusto Salazar e Ismael Rios Editors, Nova Science Publishers, Inc. NY USA.



Additional materials	<ul style="list-style-type: none"> ○ UNI-EN 13031-1 “Greenhouses: Design and Construction. Part 1: Commercial production greenhouses” Milano ○ http://www.pati.it/ ○ http://www.richel.fr/ ○ www.architetto-online.it / com ○ www.edilportale.com/ ○ http://www.aiia.info/ ○ http://www.eurageng.net/ ○ http://www.asabe.org/ ○ www.agronomi.it/conafweb.htm
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Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
75	16	14	45
ECTS			
3	2	1	
Teaching strategy			
<p>Lectures will take place by means of Power Point presentations. Public platforms, such as Teams, could be used for lectures. Practical exercises will concern samples of construction materials, climatic parameters measurement instruments and equipment design.</p>			
Expected learning outcomes			
Knowledge and understanding on:	<ul style="list-style-type: none"> ○ Knowledge and understanding of materials, structural elements and systems environmental sustainability for protected cultivation ○ Understanding on the energy balance of a greenhouse ○ Knowledge and understanding on structure and equipment for protected cultivations ○ Knowledge and understanding on technological equipment in support of protected cultivation 		
Applying knowledge and understanding on:	<ul style="list-style-type: none"> ○ Capacity to identify sustainable covering materials, structural elements and construction systems of buildings for protected cultivations depending on the period of cultivation, the geographical area and the cultivated species ○ Capacity to identify the technical characteristics of the equipment for greenhouses according to greenhouse energy balance, cultivation period, geographical area and cultivated species 		
Soft skills	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Expertise in the classification of materials and construction types of buildings for the protection of horticultural-fruit-vegetable cultivations ○ Expertise to sustainable design of structures and equipment for the protection of horticultural-fruit-vegetable cultivations ○ Expertise in the choice of materials and equipment for buildings for the protection of horticultural-fruit-vegetable cultivations • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability to communicate information, ideas, problems and solutions regarding structures and equipment for the protection of horticultural-fruit-vegetable cultivations to both specialist and non-specialist audiences 		



	<ul style="list-style-type: none"> ○ Ability to communicate information, ideas, problems and solutions regarding the sustainable design of structures and equipment for the protection of horticultural-fruit-vegetable cultivations to both specialist and non-specialist audiences ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Capacity to continue learning future development of new and sustainable materials, structural elements and systems for buildings for the protection of horticultural-fruit-vegetable cultivations
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Assessment and feedback	
Methods of assessment	
Evaluation criteria	<ul style="list-style-type: none"> ● <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ Knowledge and understanding of fundamentals of heat transmission ○ Knowledge and understanding of materials, structural elements and systems environmental sustainability for buildings for protected cultivations ○ Knowledge and understanding of greenhouse energy balance ○ Knowledge and understanding of the design criteria of the structural, construction and functional aspects of buildings for protected cultivations ● <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ Capacity to identify sustainable materials, structural elements and construction systems of buildings for protected cultivations ○ Ability to critically analyse structures and equipment for buildings for protected cultivations ● <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ Expertise of materials and construction types classification of buildings for protected cultivations ○ Expertise to evaluate different solutions of structures and equipment for protected cultivations ○ Expertise to design different solutions of structures and equipment for protected cultivations ○ Expertise to evaluate different solutions of sustainable management of existing structures and equipment for protected cultivations ● <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Communicating knowledge and understanding about solutions regarding structures and equipment for protected cultivations ○ Communicating knowledge and understanding about the sustainable design of structures and equipment for protected cultivations ● <i>Communication skills</i> <ul style="list-style-type: none"> ○ Ability to communicate information, ideas, problems and solutions regarding structures and equipment for protected cultivations, and for the sustainable design of structures and equipment for protected cultivations ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Learning ability and overall correlation among various issues of the lectures ○ Self-follow-up learning ability of future development of buildings for protected cultivation and for conservation of horticultural-fruit-vegetable products



Criteria for assessment and attribution of the final mark	<p>The final exam consists on an oral test with questions related to the course programme lectures and practical exercises.</p> <p>The final mark is expressed in thirtieths. The exam is passed if the mark is at least 18/30.</p> <p>A partial test after the first part of the lectures will take place. The partial test will consist on an oral test with questions related to the course programme. The partial test mark is expressed in thirtieths. The partial test is passed if the mark is at least 18/30.</p> <p>Foreign students can take the exam in English language.</p>
Additional information	