COURSE OUTLINE

(1) GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	Agricultural		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	AGRI_303	SEMESTER	3rd Semester
COURSE TITLE	Agricultural and Greenhouse Constructions		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Course delivery	3	
Tutorial	-	
Laboratory course	2	
TOTAL	5	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge
PREREQUISITE COURSES:	No prerequisite courses
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to present, inform and educate students on technologies and techniques related to both agricultural constructions and greenhouses. Particular emphasis is given to understanding all the phenomena taking place in a greenhouse so they can analyze them and be able to choose the necessary equipment to help them achieve the right microclimate conditions inside the greenhouse for optimal qualitative and quantitative production.

Students, after completing the course, will be able to:

- Understand the basic characteristics of solar radiation in relation to the operation of greenhouses

- Understand the properties of different flexible and stiff greenhouse cover materials, select the appropriate materials for each crop and type of greenhouse and maintain them in an appropriate way.

- Understand the behavior and characteristic properties of greenhouse materials (wood, aluminum, steel) and opt for a combination of criteria relating to functionality, cost, compatibility with cover materials, etc.

- Understand and apply greenhouse design criteria for greenhouse type selection, geometric features, structural features and coverage materials, foundation, drainage, placement, taking into account microclimate impacts, functionality, costs, wind pressure and other actions.

- Understand the natural phenomena associated with the micro-climate of the greenhouse

- Have knowledge of the basic technologies used in greenhouses

- Have the ability to collect and interpret relevant data to shape judgement involving reflection on issues related to farm buildings and greenhouses

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

Upon completion of this course, the student will develop the following general competencies (from the list above):
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision Making Autonomous Laboratory Work / Teamwork
Design and management of greenhouses and farm units
Promoting free, creative and inductive thinking in choice of systems and materials

(3) SYLLABUS

Theoretical part

1. Introduction (historical overview, statistics, greenhouse types, greenhouse crops)

2. Radiation (Solar/Thermal radiation, solar spectrum, solar radiation intensity, calculation of incident solar radiation)

3. Microclimate – Solar Radiation (Lighting), Temperature, Humidity

4. Physical and dynamic Ventilation. Systems – Equipment.

5. Heating (systems, equipment). Infrared radiation & heating. Systems – Equipment.

6. Cooling - Cooling, Relative humidity control. Systems – Equipment.

7. Energy balance of greenhouses

8. Artificial lighting, CO_2 enrichment, Disinfection. Systems – Equipment.

9. Digital Transformation. Automatic Control Systems & Decision Support Systems. Cutting-edge Technologies

10. Networks and Their Contribution to Rural Economy

11. Automatic Meteo Stations. Sensors, Dataloggers, and processing of experimental micro- and macro-climate data of the area of greenhouse systems. Operation of networks receiving data from the AMS.

12. Warehouses for agricultural products (General Warehouses - grass Warehouses -fruit Warehouses – Potato warehouses- Silos - Warehouses of Fresh Vegetables - Dryers)

Laboratory part:

1. Design of greenhouse construction (greenhouse design criteria, types of greenhouses and structural features, impact on microclimate, functionality, cost, support of covering materials,

foundation, drainage, winding, siting)

2. Greenhouse coverage materials - glass panes (generally for glass, glass panes, glazing types, glazing properties and behavior of glass panes as glasshouse cover materials)

3. Plastics (generally polymer and plastic, flexible plastic sheets and hard plastic surfaces, characteristics, properties and behavior of selected stiff and flexible plastic sheets, effect of additives on polyethylene sheets, coating materials with selected light transmittance)

4. Construction materials (General wood, structural wood as greenhouse material, characteristic properties and behavior of wooden greenhouses, protection.) General aluminum and steel, aluminum and steel as greenhouse materials, characteristic properties and behavior of aluminum greenhouses and steel, protection)

5. Calculation of energy losses and Thermal Needs of Greenhouses and Agricultural Units. Greenhouse Energy Balance

6. Statistical processing of micrometeorological parameters with a computational program. Analysis of meteorological data to determine the climate of the area of greenhouse systems.

7. Field trips.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face (theoretical teaching) Laboratories with exemplary solution of representative problems.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT (PowerPont Presentations) in teaching and communication with students. Use of an e-learning platform (e-class).
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	*Semester workload*
Lectures (3 contact hours per week x 13 weeks)	39
Laboratory exercise, field exercises with resolving representative problems (2 contact hours per week x 6 weeks)and educational visits	12
Study hours and preparation for final exams, final exams	74
Course total (25 hours workload per credit unit)	***125 hours total workload***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	1. Attending classes - Participating in the room - Short Answer Questions 2. Solving laboratory exercises in the laboratory part of the course 3. Solving laboratory exercises 4. Final written exams of the entire syllabus (Theory and Laboratory) which includes multiple choice questions, questions about small development and solving exercises. Minimum passing grade: 5. 5. All of the above are taking place in the Greek language and for the foreign students (eg ERASMUS students) in English.

(5) ATTACHED BIBLIOGRAPHY

1. C. Stanghellini, B. Ooster, E. Heuvelink, Επιστ. Επιμ. Νικόλαος Κατσούλας (2019). Θερμοκήπια. ΠΕΔΙΟ ΕΚΔΟΤΙΚΗ,ΔΙΑΦΗΜΙΣΤΙΚΗ ΚΑΙ ΡΑΔΙΟΤΗΛΕΟΠΤΙΚΩΝ ΠΑΡΑΓΩΓΩΝ Α.Ε. ISBN: 978-960-635-089-4
2. Μαυρογιαννόπουλος Γεώργιος. (2017). Τεχνολογία Θερμοκηπίων / Μικροκλίμα - Υλικά - Κατασκευή - Εξοπλισμός. Εκδόσεις Σταμούλη Α.Ε, Αθήνα. ISBN: 9786185304515
3. Paul V. Nelson. (2008). Greenhouse Operation and Management (7th Edition). Prentice Hall. ISBN-10: 0132439360
4. James Boodley. (2008). The Commercial Greenhouse (3rd Edition). CENGAGE Delmar Learning. ISBN-10: 1418030791
5. Tiwari G. N. (2003). Greenhouse Technology for controlled Environment. Alpha Science International Ltd. ISBN- 10: 1842651358 / ISBN- 13: 9781842651353