## COURSE MODULE OUTLINE

### General information

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| **SCHOOL** | School of Science and Technology | | |
| **PROGRAM COURSE** | Interdisciplinary PSP cultivations under cover-Hydroponics (KYK) | | |
| **LEVEL OF STUDY** | Postgraduate program-Master of Science (MSc) | | |
| **COURSE UNIT CODE** | **KYK50** | | Second semester |
| **COURSE TITLE** | Under cover crop environment | | |
| **INDEPENDENT TEACHING ACTIVITIES** *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits* | | **WEEKLY TEACHNG HOURS** | **CREDITS** |
| Weekly workload hours: 21-22 hours x 13 weeks | | 280 | 10 ECTS |
| *Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4* | | | |
| **COURSE TYPE** Compulsory, Optional, Optional mandatory | Compulsory | | |
| **PREREQUISITE COURSES:** | no | | |
| **LANGUAGE OF INSTRUCTION AND EXAMS:** | The language of instruction of the programme is Greek | | |
| **THE COURSE IS OFFERED TO ERASMUS STUDENTS** | no | | |
| **COURSE WEBSITE (URL)** | https://www.eap.gr/en/crops-under-cover-hydroponics/topics/#k50<br><br>Each module has its own space in the Learning Management System of EAP (https://courses.eap.gr/login/index.php), with controlled access (use of code) for students and teaching staff. | | |

## (2) LEARNING OUTCOMES

***Learning Outcomes***

*The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:*

***APPENDIX A***

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

***APPENDIX B***

- *Guidelines for writing Learning Outcomes*

Upon successful completion of this unit, students will be able to:

- Understand the greenhouse as a crop production system

• Understand the effect of solar radiation (intensity and spectrum) on plant growth and morphology
• Recognize the different bands of the solar radiation spectrum and their relationship with agricultural production as well as how to measure them
• Understand and calculate basic elements of solar techniques
• Understand solar maps and use them to determine shading periods
• Calculate the heating-ventilation and cooling periods using the climograph
• Be familiar with greenhouse covering materials, their properties and how to choose them according to the type of greenhouse and the crop
• Be familiar about the use of screens as shading equipment and more generally the use of screenhouses for the production of agricultural products
• Understand the basic concepts of the greenhouse energy balance and use it to select the appropriate greenhouse air conditioning system.
• Understand the basic concepts of greenhouse water balance and how this affects the humidity inside the greenhouse
• Be informed about temperature and solar radiation measurement sensors, their operating principles and the selection of different types of sensors.
• Be informed about humidity, speed and wind direction sensors, their operating principles and the selection of different types of sensors.

**General Competences**

*Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*

*Search for, analysis and synthesis of data and information by the use of appropriate technologies,*
*Adapting to new situations*
*Decision-making*
*Individual/Independent work*
*Group/Team work*
*Working in an international environment*
*Working in an interdisciplinary environment*
*Introduction of innovative research*
*Project planning and management*
*Respect for diversity and multiculturalism*
*Environmental awareness*
*Social, professional and ethical responsibility and sensitivity to gender issues*
*Critical thinking*
*Development of free, creative and inductive thinking*
*……*
*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.) …….*

Acquire of the background knowledge in order to deal with applied subjects.
Search for, analysis and synthesis of data and information by the use of appropriate technologies
Individual/Independent work

Working in an interdisciplinary environment
Introduction of innovative research
Environmental awareness

## (3) COURSE CONTENT

This thematic section aims to provide a background of knowledge about the greenhouse environment, the main climate parameters that shape it, how they are measured and the main types of sensors as well as the basic energy and mass balances of the greenhouse and how they can be used in the selection of the appropriate greenhouse environmental control system. It includes the following units:

- General about crops under cover
- Crop response to environmental factors
- Radiation in greenhouses
- Elements of solar technology
- Calculation of insolation and shading of surfaces solar charts
- Climograph as a tool for assessing the climate suitability for crops under cover
- Greenhouse covering materials
- Use of screens in crops under cover - Screenhouses
- Energy balance of crops under cover
- Water balance of crops under cover
- Sensors measuring environmental parameters under cover I. Temperature and solar radiation
- Sensors measuring environmental parameters under cover II. Humidity, Wind speed and direction

## (4) TEACHING METHODS--ASSESSMENT

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| **MODES OF DELIVERY**<br>*Face-to-face, in-class lecturing, distance teaching and distance learning etc.* | • distance learning using the HOU's E-Learning Platform and conducting Group Consultative Meetings (tele-GCM). |
| **USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**<br>*Use of ICT in teaching, Laboratory Education, Communication with students* | • Use of ICT in teaching, Communication with students<br>More specifically, we use :<br>• Remote meetings tools (webex),<br>• Presentation software (e.g. power point),<br>• Specialized software in the subjects under study.<br>• Additionally, the students use office automation tools, web browsers and e-reader for digital books. |
| **COURSE DESIGN**<br>*Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay* | |

| ***Activity/Method*** | ***Semester workload*** |
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| 3 meetings (4hrs) | 12 hrs |
| 2 educational activities | 30 hrs |
| 1 written assignment (semester essay) | 60 hrs |
| Final examinations | 3 hrs |

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| *writing, Artistic creativity, etc.*<br><br>*The study hours for each learning activity as well as the hours of selfdirected study are given following the principles of the ECTS.* | Individual study: 168-181 hrs<br>**Total course work load**: 273-286 hrs |
| **STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS**<br>*Detailed description of the evaluation procedures:*<br><br>*Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.*<br><br>*Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.* | • a1. Two (2) Short Written Essays, with weighting factor to the class unit's final grade 10% each.<br>• a2. One (1) Semester Essay with weighting factor to the class unit's final grade 20%.<br>• a3 The right to participate in the final exams is secured if there is at least 50% of the sum of what is potentially excellent from all the essays collected and graded, that is 20 units overall out of 100, according to the weighting factors referred to in points a1 and a2.<br>• a4. The grade of the written assignments (short and semester) is activated only with a grade equal to, or above the base (≥5) in the final or repeated exams.<br>• All criteria are posted in each module's webpage, as well as in the programme's general page.<br>• The final examination includes a multiple choice sheet, as well as oral examination and accounts for 60% of the total grade.<br>There are all the criteria posted, both in each written assignment (in the study) and in the general regulation: https://www.eap.gr/wp-content/uploads/2022/03/kanonismos-spoudwn-isxys-apo-to-didaktiko-etos-2022-2023.pdf |

## (5) SUGGESTED BIBLIOGRAPHY:

**-Suggested bibliography**


- Kittas E & Katsoulas N. (2020) .Greenhouse environment
- Stanghellini, C., Ooster van' t, B. & Heuvelink, E., (scientific ed. N. Katsoulas) (2019). Greenhouse. Technologies for optimum production. Athens. Pedio Press


**Optional:**


- G. Mavrogianopoulos, Greenhouse D Edition.,(2005), Stamoulis Press


**-Related scientific Journals**

Biosystems Engineering
Computers and Electronics in Agriculture
Sensors
Transactions of the ASABE
Scientia Horticulturae
Acta Horticulturae
Applied Engineer in Agriculture
Agricultural Engineering International: the CIGR Journal
Journal: Solar Energy
Journal: Agronomy
Journal: Energy and Buildings