

COURSE OUTLINE

1. GENERAL

FACULTY	AGRICULTURAL PRODUCTION, INFRASTRUCTURE AND ENVIRONMENT		
SECTION	UTILIZATION OF NATURAL RESOURCES & AGRICULTURAL ENGINEERING		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE CODE	108	SEMESTER OF STUDY	9th
COURSE TITLE	HYDROPONIC FACILITIES		
INDEPENDENT TEACHING ACTIVITIES <i>in case credits are awarded in distinct parts of the course e.g. Lectures, Laboratory Exercises etc. If the credits are awarded uniformly for the entire course, indicate the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
LECTURES		3	3
LABORATORY EXERCISES		2	2
TOTAL		5	5
<i>Add rows if needed. The teaching organization and teaching methods used are described in detail in 4.</i>			
COURSE TYPE <i>background, general knowledge, scientific area, development Skill</i>	SCIENTIFIC AREA – SKILLS DEVELOPMENT		
PREREQUISITE COURSES :	<ul style="list-style-type: none"> • GREENHOUSE FACILITIES 		
LANGUAGE OF INSTRUCTION and EXAMINATION:	GREEK		
THE COURSE IS OFFERED IN ERASMUS STUDENTS	NO		
WEBSITE COURSE (URL)	To be constructed		

2. LEARNING OUTCOMES

<p>Learning Outcomes</p> <p><i>The learning outcomes of the course, the specific knowledge, skills and competences are described appropriate level that students will acquire after the successful completion of the course.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the Level of Learning Outcomes for each cycle of study according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning</i> <p><i>and Appendix B</i></p> <ul style="list-style-type: none"> • <i>Learning Outcomes Writing Summary Guide</i>
<p>The course is a tool for introducing students to the concepts of designing hydroponic systems and their necessary equipment.</p> <p>Initially, an attempt is made to introduce non-soil crops to the concepts of aerial environment and plant root environment and the parameters of the microclimate that shape it.</p> <p>Then, an attempt is made to introduce students to the various techniques and systems used for cultivation outside the soil. Data are given on the characteristics of substrates used in hydroponic crops and on the dimensioning of the necessary irrigation and fertilization systems of hydroponic crops. At the same time, the nutrient needs of hydroponic crops are calculated and the necessary systems for the management of nutrient solutions are presented.</p> <p>Upon successful completion of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand the basic and critical characteristics of hydroponic crops and the systems used to synthesize an effective hydroponic

installation.

- Understand the basic and critical characteristics of substrates used in hydroponic crops and how to manage them.
- Understand the basic elements and devices required for measurement and automatic control of hydroponic systems.
- Analyze the individual design steps of a hydroponic cultivation system.
- To prepare and evaluate studies for the design and operation of hydroponic installations, for various types of hydroponic crops and hydroponics systems. .

General Competencies

Taking into account the general competencies that the graduate must have acquired (as listed in Diploma Supplement and listed below) which of them is the course aimed at?.

<i>Search, analyze and synthesize data and information, using the necessary technologies</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for diversity and multiculturalism</i>
<i>Decision making</i>	<i>Respect for the natural environment</i>
<i>Autonomous work</i>	<i>Demonstrate social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Teamwork</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Promoting free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	
<i>Generation of new research ideas</i>	

Search, analysis and synthesis of data and information, using the necessary theoretical knowledge and established technologies

Putting theoretical knowledge into practice
Autonomous work

Teamwork

Working in an interdisciplinary environment

Decision making

Promoting free, creative and inductive thinking

3. COURSE CONTENT

Import

1. Introduction to the technique of hydroponics. Introductory concepts and definitions. Hydroponic systems, nutrient solution, acidity and electrical conductivity of the nutrient solution.
2. Growth factors of hydroponic crops. Pros and cons of hydroponic crops. Areas of application of hydroponics.
Substrates of hydroponic crops
3. Inorganic and organic substrates. Stone wool, perlite, pumice, peat, kokofinika, etc.
4. Physical and chemical characteristics of substrates. Porosity, air permeability, apparent specific gravity, pH, alternative capacity, etc.
The movement of the nutrient solution
5. The movement of water from the substrate to the root and plant. The environment of the root, osmotic potential, the movement of water in the plant, transpiration and its role in the movement of nutrient solution and nutrients.
Systems and equipment
6. Methods and systems of hydroponic cultivation. Open and closed systems. Cultivation systems with or without substrate. Growing in canals, tanks, pots, etc.
7. Hydroponic cultivation equipment. Irrigation system, nutrient solution collection and recirculation system.
Irrigation and fertilization
8. Irrigation of hydroponic crops. Calculation of water needs.
9. Methods of starting irrigation. Irrigation based on time, solar radiation, moisture in the substrate, indicators of water status in the plant and a combination of the above.
10. Preparation of nutrient solution. Nutrient solution preparation method. Calculation of macrodata needs.
11. Nutrient solution preparation method. Calculation of microelement needs.

- Nutrient solution preparation systems.
12. Wired and wireless sensor network systems for measurement transmission from hydroponic systems and automated systems for recording and processing measurement parameters.
 13. Automation and control systems. Control of acidity and electrical conductivity of nutrient solution. Use of sensors to control conditions in the plant root environment. Effect of the greenhouse environment on hydroponic plant cultivation.
 14. Methods of disinfection of nutrient solutions. Disinfection with heating, ultraviolet radiation, using sand filters, etc.
 15. Models of correlation of climatic factors and plant growth.
 16. Technical case studies and types of hydroponic installations.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

DELIVERY METHOD <i>Face-to-face, Remote education, etc.</i>	Face to face	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES <i>Use of ICT in Teaching, Laboratory Training, Communication with students</i>	✓ Use of ICT in Teaching and Communication with students ✓ Laboratory Training	
TEACHING ORGANIZATION <i>The method and methods of teaching are described in detail.</i> <i>Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliography Study & Analysis, Tutorial, Internship (Placement), Clinical Practicing, Art Workshop, Interactive Teaching, Educational visits, Project Writing, Writing a project / assignments, Artistic creation, etc.</i> <i>The student's study hours for each learning activity are listed as well as the hours of unguided study so that the total workload at semester level corresponds to ECTS standards</i>	Activity	Workload Semester
	Lectures	90
	Laboratory Exercises	60
	TOTAL	150
STUDENT EVALUATION <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay/ Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Examination of a Patient, Artistic Interpretation, Other / Others</i> <i>Explicitly defined evaluation criteria and whether and where they are accessible to students are mentioned.</i>	1. Written Examination (In conclusion on of Theory): 100% 2. Technical laboratory reports: 40% 3. Oral examination in laboratory environment: 60%	

5. RECOMMENDED-BIBLIOGRAPHY

- Suggested Bibliography :*
-Additional suggested bibliography:
1. Mavrogiannopoulos G.N., 2006. Hydroponic installations. Stamoulis Publications, Athens.
 2. Savvas D. and Passam H., 2002. Hydroponic production of vegetables and ornamentals. Embryo publications, Athens, Greece.
 3. Jones B. 2005. Hydroponics. CRC publications

4. Roberto K., 2003. How to hydroponics. www.howtohydroponics.com

5. Raviv, M. and Lieth J.H. 2007. Soilless Culture: Theory and Practice. Elsevier Science, 500 pages

-Related scientific journals:

Scientia Horticulturae, HortScience, Acta Horticulturae, Biosystems Engineering, Transactions of the ASABE, Computers and Electronics in Agriculture.