COURSE OUTLINE

1. GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	BIOSYSTEMS& AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	BAE 920	**SEMESTER**	9th
COURSE TITLE	PRECISION AGRICULTURE		

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**
Lectures	3	
Tutorials	2	
Laboratory	0	
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*	Skills Development
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/

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 course deals with:

 Specialized knowledge in the field of application of Intelligent Agriculture methods and technologies. The modules of the course aim to analyze and understand the basic elements (terms, systems, technologies, processes) of intelligent agriculture and how they can be used both to collect and analyze data and to use them for the purpose of more rational management of inputs in the agricultural sector.

After completing the course, students:

 They will be introduced to the basics of smart agriculture and the Internet of Things (IoT)

 They will have a comprehensive understanding that the upgrading of the agricultural sector will also come through the education of the new generations in the innovation and digitization of the agricultural sector

They will acquire knowledge in advanced IT technologies related to Intelligent Internet Applications in the agricultural sector
They will gain knowledge of the operation of sensors and robotic systems in agricultural production

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

At the end of this course the student will have further developed the following general skills:
Search, analysis and synthesis of data and information, also using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Generating new research ideas
Respect for the natural environment
Exercise criticism and self-criticism
Promotion of free, creative and inductive thinking

3. SYLLABUS

1. Introduction to smart agriculture and precision agriculture. Integrated approach to management of agricultural activity. Use of modern technologies. Digital transformation of the agricultural sector. Input control. Research methodology. Development of skills in writing scientific papers and technical reports. Presentation of scientific and technical works
2. Modern digital Information and Communication Technologies and planned methods of data collection, processing, storage and dissemination. Broadband in the countryside. Internet applications. Analysis, design and architecture of web applications.
3. Internet of Things (IoT) and Agriculture 4.0. Analysis of big data (BigData). The future of IoT: 5th Generation (5G) requirements, architecture, infrastructure and applications. Big Data, cloud computing and data centers. Key features of SDN networks. Artificial Intelligence Applications.
4. Automatic Control Systems, Modern Digital Technologies (ICT) and Process Regulation in greenhouse systems. Integrated robotic systems for managing greenhouse units (cablebots – agbots), based on IoT technologies Microclimate control of Greenhouses and agricultural units
5. Factors of production (soil/climate, labor, capital – inputs, management). Agricultural productivity. Relationship between agriculture and environment in a sustainable way. Control of nutrition in hydroponic crops. Meteorological applications and data management Automatic Control Systems and Process Regulation. New technologies in fertilization, irrigation and crop protection. Data collection and analysis methods. Organization of data for analytical processing. Energy input - output. Reduced use of inputs that have a negative impact on the environment, to cover the objectives related to agriculture.
6. Principles and methods of precision agriculture management, The concept of variability, Spatial variability, Spatio-temporal change of the properties and characteristics of the soil, crop and other parameters of the field,

7. Remote sensing applications to measure variability for agricultural applications
8. Crop Attribute Mapping Methods and Applications, Global Positioning System (GNSS) Systems and Accuracy, Production Mapping Sensors, Sensors for Measuring Soil and Crop Parameters
9. Surface modeling and spatial interpolation.
10. Precision agriculture data analysis
11. Application of variable input rates, crop diversification
12. Self-propelled vehicles as sensor carriers for measuring variability in the field
13. Applications of precision agriculture in Greece

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face deliveries.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of ICT (power point) in Teaching
• Use of ICT (power point) in Laboratory Training
• Video presentation
• Use of ICT in Communication with students (Learning process support through the electronic platform e-class).</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorials</td><td>26</td></tr>
<tr><td>Study and literature survey</td><td>20</td></tr>
<tr><td>Exams</td><td>10</td></tr>
<tr><td>Unguided study</td><td>30</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>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</td><td>1. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with knowledge from other courses.
The evaluation is continuous and dynamic. It mainly includes short project work, solving problems or answering open questions. Exams are conducted orally or in writing or a combination of the two, with or without pre-examination of the key topics of the course, with or without progressions and by other inventive methods, depending on the dynamics and the needs of the audience</td></tr>
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examination of patient, art interpretation, *other* *Specifically-defined evaluation criteria are* *given, and if and where they are accessible to* *students.* 1	

5. RECOMMENDED LITERATURE in Greek

- Govind Singh Patel, Amrita Rai, Nripendra Narayan Das, R.P. Singh, Smart Agriculture, O'Reilly CRC Press 2021, ISBN: 9781000327892 https://www.oreilly.com/library/view/smart-agriculture/9781000327892/
- ΣΠΥΡΙΔΩΝ ΦΟΥΝΤΑΣ, ΓΕΩΡΓΙΑ ΑΚΡΙΒΕΙΑΣ, Διαθέτης (Εκδότης): Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα - Αποθετήριο "Κάλλιπος" 2016, ISBN: 978-960-603-135-9

Scientific journals

- Encyclopedia of Smart Agriculture Technologies 2022, https://link.springer.com/referencework/10.1007/978-3-030-89123-7