COURSE OUTLINE

(1) GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	Agriculture		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	AGRI_ EE1	**SEMESTER**	**8th Semester**
COURSE TITLE	Smart 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**
Course delivery	3	
Laboratory course	-	
Tutorial	1	
TOTAL	**4**	**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*	Specialized 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 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.

Upon completion of the course students will:

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

Upon completion of this course the student will have further developed the following general competencies:

- Search, analyze and synthesize data and information using the necessary technologies
- Adaptation to new situations.
- Working in an interdisciplinary environment
- Decision-making.
- Project planning and management
- Working independently
- Team work

(3) SYLLABUS

1. Introduction to Smart Agriculture. Integrated approach to management of agricultural activity. Utilization of modern technologies. Digital transformation of the agricultural sector. Input control Modern digital Information and Communication Technologies and planned methods of data collection, processing, storage, and dissemination. Outdoor broadband.
2. 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. Automatic Control Systems, Digital technologies (ICT), and Process Configuration in greenhouse systems Integrated IoT-based greenhouse control robotic systems (cablebot – agbot)
3. Factors of production (soil/climate, labor, capital – inputs, management). Agricultural productivity. Relationship between agriculture and environment in a sustainable way.
4. 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 Greenhouse microclimate control and agricultural units Nutrition Control in Hydroponic Crops
5. Meteorological applications and data management Internet applications. Analysis, design, and architecture of web applications. Big Data, cloud computing and data centers. Key features of SDN networks. Artificial Intelligence Applications. Input - output of energy. Reduced use of inputs that have a negative impact on the environment, to cover the objectives related to agriculture.
6. Spatio-temporal variation of the properties and characteristics of the soil, the crop, and other parameters of the plot of land
7. Principles and methods of precision agriculture management. Methods and applications of crop characteristic mapping. Global Positioning System (GNSS) systems and accuracy.
8. Production mapping sensors. Sensors for measuring soil and crop parameters.
9. Remote sensing applications to measure variability for agricultural applications Surface modeling and spatial interpolation. Precision agriculture data analysis. Application of variable

input rates, and crop diversification.

10. Unmanned vehicles as sensor carriers for measuring variability in the field. Applications of precision agriculture in Greece. The laboratory exercises aim to deepen and familiarize the students with the concepts and methodologies analyzed in the theoretical part. Particularly:
11. Use and applications of G.P.S.
12. Software applications in precision agriculture.
13. • Analog map scanning and georeferencing • Import, process, and rendering of cartographic data. • Composition and production of thematic maps in a digital environment. • Applications in Precision Agriculture.

(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*	
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. Course attendance - Participation in the classroom 2. Projects that require synthesis of information and critical thinking from the student (30% of the final total grade). 3. Written final exams for all the material that includes multiple choice questions, questions of relatively small development (70% of the final total grade). 4. Minimum passable grade: 5. All of the above takes place in the Greek language and for foreign language students (e.g. ERASMUS students) in the English language.

Activity	***Semester workload***
Lectures (3 contact hours per week x 13 weeks)	39
Tutorial (1 contact hour per week × 13 weeks)	13
Individual, group assignments, project writing	13
Study hours, preparation for the final exams, Final Exam	60
Course total (25 hours workload per credit unit)	***125 hours total workload***

(5) ATTACHED BIBLIOGRAPHY

- 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

Relevant scientific journals:

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