COURSE OUTLINE

1. GENERAL

SCHOOL	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCE DEVELOPMENT & AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**259**	**SEMESTER**	8^{TH}
COURSE TITLE	**OPTIMISATION TECHNIQUES AND COMPUTATIONAL INTELLIGENCE IN 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**
THEORY	2	2
LABORATORY EXERCISES	2	2
TOTAL	**4**	**4**
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 – SKILLS DEVELOPMENT**
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	**GREEK**
IS THE COURSE OFFERED TO ERASMUS STUDENTS	**NO**
COURSE WEBSITE (URL)	To be constructed

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*

Upon successful completion of the course, the student(s) will be able to:

- Understand the basic methods and techniques of optimisation and computational intelligence used in agriculture.
- Recognise the existence and evaluate the performance of applications that use advanced computational intelligence in agriculture.
- Propose and/or synthesise hardware/software solutions that incorporate optimisation and computational intelligence techniques in the agri-food sector.

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…*
	…….

Research, analysis and synthesis of data and information, using the necessary theoretical knowledge and established technologies.
Application of theoretical knowledge in practice.
Ability to work both independently and in teams.
Cultivate an interdisciplinary approach.
Decision-making.
Promotion of free, creative and deductive thinking.

3. SYLLABUS

- Basic definitions of the concepts: optimisation, artificial intelligence, computational intelligence, machine learning.
- Optimisation based on formal mathematical models and linear programming.
- Complexity analysis of problems and solutions.
- Expert systems, decision trees and applications.
- Graphs and their use in modeling and optimization problems.
- Blind and non-blind solution finding methods, "greedy" algorithms and heuristic functions.
- The role of Euclidean distance in finding practical solutions for agriculture.
- Nature-inspired solution finding algorithms.
- Techniques and examples of evolutionary algorithms.
- "Fuzzy" logic in solving practical domain problems.
- Neural networks: structure, analysis and applicability in agriculture.
- Widespread environments for developing machine learning techniques.
- Mixed techniques for solving practical problems.
- Interfacing artificial intelligence mechanisms with common agricultural automation and third-party systems.
- Student practice projects consisting of cases of increased agricultural interest.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	✓ Use of ICT in teaching and communication with students ✓ Laboratory education

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	**60**
Laboratory practice	**60**
Course total	***120***

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.

- Written Examination (Conclusion on Theory): 100%
- Technical laboratory reports: 40%.
- Oral Examination in laboratory environment: 60%.

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- ARTIFICIAL INTELLIGENCE, I. Vlahavas, P. Kefalas, N. Vassiliadis, F. Kokkoras, H. Sakellariou, ISBN 139786185196448, Ed. UNIVERSITY OF MACEDONIA.
- Introduction to computational intelligence, Kampourlazos Vasilios, Papakostas Georgios. ISBN 978-960-603-078-9. https://repository.kallipos.gr/handle/11419/3443?&locale=el
- Fuzzy Logic with Applications to the Sciences, Timothy J. Ross, ISBN¨978-9925-588-58-9, Broken Hill Publishers Ltd, Nicosia, Cyprus, 2022.

- Related academic journals:

- Liakos, K.G.; Busato, P.; Moshou, D.; Pearson, S.; Bochtis, D. Machine Learning in Agriculture: A Review. Sensors 2018, 18, 2674. https://doi.org/10.3390/s18082674.
- Loukatos, D.; Lygkoura, K.-A.; Maraveas, C.; Arvanitis, K.G. Enriching IoT Modules with Edge AI Functionality to Detect Water Misuse Events in a Decentralized Manner. Sensors 2022, 22, 4874. https://doi.org/10.3390/s22134874