COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Financial and Management Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**MH0119**	SEMESTER	10th
COURSE TITLE	Deep Learning		

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
	3	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*	Elective Course
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.fme.aegean.gr/en/c/deep-learning

(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*

At the end of the course, students are able to:

- Understand the challenges and the available methodologies with respect to training deep learning models
- Recognize the types of problems that can be solved using machine learning approaches
- Preprocess and prepare data for training and evaluating deep learning models.
- Design deep learning model architectures for text, image, and other modalities
- Use contemporary tools such as PyTorch and Tensorflow to implement deep learning algorithms

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…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Working in an interdisciplinary environment
- Production of new research ideas

(3) SYLLABUS

- History and applications of deep learning.
- Supervised and unsupervised learning, evaluation metrics.
- Neural networks, activation functions.
- Neural network training, error backpropagation algorithm.
- Cost functions, optimization algorithms, regularization.
- Data preprocessing and augmentation.
- Deep convolutional networks.
- Recurrent networks, LSTMs, GRUs.
- Attention mechanisms and Transformer architectures.
- Autoencoders.
- Generative models.
- Deep reinforcement learning.
- Ethics issues, AI bias.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT for communication with the students
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 — 39 hours (1.56 ECTS) Self-study — 83 hours (3.32 ECTS) Final exam — 3 hours (0.12 ECTS) **Course total** — **125 (5 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.*	Final exam

(5) ATTACHED BIBLIOGRAPHY

- Aaron Courville, Ian Goodfellow, Yoshua Bengio. Βαθιά Μάθηση. ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ (2024)
- Charu C. Aggarwal. ΝΕΥΡΩΝΙΚΑ ΔΙΚΤΥΑ ΚΑΙ ΒΑΘΙΑ ΜΑΘΗΣΗ. Fountas (2020)
- Λυκοθανάσης Σπυρίδων, Κουτσομητρόπουλος Δημήτριος. Υπολογιστική Νοημοσύνη και Βαθιά Μάθηση. Κάλλιπος, Ανοικτές Ακαδημαϊκές Εκδόσεις (2023)