COURSE OUTLINE

(1) GENERAL INFORMATION

SCHOOL	POLYTECHNIC SCHOOL		
DEPARTMENT	ELECTRICAL AND COMPUTER ENGINEERING		
LEVEL OF STUDIES	*POSTGRADUATE*		
COURSE CODE		**SEMESTER**	**2o**
COURSE TITLE	Industrial AI and IoT		
COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS CREDITS**
Lectures and tutorials		3	5
Add extra space if necessary			
COURSE TYPE Scientific field *special knowledge* Development of special skills	Compulsory/Elective		
PREREQUISITES:			
LANGUAGE OF INSTRUCTION and EXAMS:	Greek		
COURSE AVAILABLE TO ERASMUS STUDENTS:	yes		
COURSE WEB PAGE (URL)			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion, students will: **1. Design and implement AI models for industrial IoT systems (predictive maintenance, anomaly detection).** **2. Integrate IoT architectures (sensors, edge/cloud computing) with AI pipelines.** **3. Analyze industrial data streams using machine learning and deep learning tools.** **4. Address challenges in scalability, latency, and security for industrial IoT.** **5. Develop energy-efficient AI solutions for resource-constrained IoT devices.**
General Skills

Interdisciplinary problem-solving in industrial automation.

- Team collaboration for IoT-AI system design.
- Ethical and secure deployment of industrial AI systems.
- Use of cloud platforms (AWS IoT, Azure IoT) and edge computing frameworks.

(3) COURSE CONTENT

Part 1: Foundations of Industrial IoT

1. IoT Architectures: Sensors, communication protocols (MQTT, LoRaWAN), edge-cloud integration.
2. Industrial Data Acquisition: Real-time streaming, preprocessing, and storage.
3. IoT Security: Encryption, authentication, and threat mitigation.

Part 2: AI for Industrial Systems

1. Machine Learning for Industrial Data: Regression, classification, time-series analysis.
2. Deep Learning Applications: CNNs for visual inspection, LSTMs for predictive maintenance.
3. Edge AI: TensorFlow Lite, ONNX Runtime, and model optimization.

Part 3: Integration and Case Studies

1. Digital Twins: Simulation and monitoring of industrial processes.
2. Case Studies: Smart manufacturing, energy grids, and supply chain optimization.
3. Ethics and Sustainability: Bias mitigation, energy-efficient AI.

(4) TEACHING and LEARNING METHODS - ASSESSMENT

COURSE DELIVERY MODE *lectures, face-to-face, distance learning etc.*	Lectures and tutorials
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *e.g. use of audiovisual media and computers etc.*	• Support of learning process through e-class platform. • IoT platforms (Raspberry Pi, Arduino). • AI frameworks (PyTorch, TensorFlow).
TEACHING METHODS *Derailed description of the teaching methods used:* *Lectures, Seminars, Laboratory exercises, Study & bibliography analysis, Tutoring, Internship/Practicum, Art Workshop, Interactive Teaching, Projects, Written Assignments, Artistic creation etc.* *Study hours for each learning activity are included along with the non-guided study hours according to the ECTS principles*	
ASSESSMENT METHODS AND CRITERIA *Description of the assessment methods and criteria:* *Language of Assessment, Assessment Methods, Formative or Concluding Assessment, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Reports, Oral Exam, Essay, Oral Presentation, Clinical Examination of patient, Artistic Performance, Others* *Assessment criteria are explicitly defined and stated.*	I. Written final examination (80%) including - Multiple choice questions - Multiple Choice Questions - Multi-choice essay questions Short answer questions - Comparative assessment of theoretical elements - Laboratory work II. Presentation of individual/group work (20%)

Method Description	***Semester workload***
Lectures and tutorials	39
Individual project	70
Individual Study	41
Total	***150***

(5) RECOMMENDED BIBLIOGRAPHY

- Recommended Bibliography:

Rajkumar Buyya et al. (2021). Internet of Things: Principles and Paradigms. Morgan Kaufmann.
François Chollet (2021). Deep Learning with Python. Manning.
Jan Holler et al. (2014). From Machine-to-Machine to the Internet of Things. Academic Press.

Related Journals/Conferences:

- *IEEE Internet of Things Journal*
- *Journal of Industrial Information Integration*
- *ACM/IEEE International Conference on Cyber-Physical Systems*