Course Title:	Smart Systems and Internet of Things				
Course Code:	ACOE447				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year	4th Year				
Teacher's Name	Dr. Konstantinos Tatas				
ECTS	6	Lectures/week	3	Laboratories/week	0
Course Purpose	The purpose of the course is to introduce students to embedded system design concepts and tools. Distinguish between embedded and general-purpose computing systems in terms of requirements. Furthermore, develop the requirements and specifications for an embedded system. Finally, implement embedded systems using sensors, actuators and embedded processors.				
Learning outcomes	1. List the distinguishing features that make a device and system smart. 2. Identify the key technologies involved in smart systems and the role of each one 2. Evaluate embedded system interface technology for a particular smart/IoT system application. 3. Identify the challenges in smart device and smart system design. 4. Explain the ways with which AI and Deep Learning can be applied to a smart system. 5. Resolve ethical issues posed by smart systems.				
Prerequisites:	ACOE201, ACSC182		Corequisites:	None	
Course content	• **Introduction to Smart Systems:** Components of smart systems and smart devices. Sensors and actuators, embedded systems, network connections, data analytics, artificial intelligence • **Interfacing embedded systems to the physical world:** Standard interfaces, wired and wireless: RS-232, I2C, CAN, USB, Zigbee, Bluetooth and Bluetooth Low Energy, LoraWan. • **IoT system architecture and devices:** Smart device anatomy and design challenges: Power consumption, cost and time-to-market, reliability and safety. • **AI in Smart Systems:** Artificial Intelligence and Deep Learning. Augmented Intelligence and Smart Systems. Deep Learning in Smart Systems.				

	Challenges of applying AI and Deep Learning on the edge. • **Smart system applications and case studies:** examples from smart cities, e-health, autonomous vehicles, agriculture, tourism etc. • **Ethical aspects of smart systems:** human-machine ethics. Ethical issues in facial recognition, health and medicine, privacy, security and safety.
Teaching Methodology	The course is structured in lectures that are conducted with the help of both computer presentations and traditional means. Practical examples and exercises are included in the lectures to enhance the material learning process. Often short post-lecture quizzes are used to assess the level of student understanding and provide feedback. Student questions are addressed during the lecture, or privately after the lecture or during office hours. Lecture notes are available through the web for students to use in combination with the textbooks. Students are assessed continuously and their knowledge is checked through tests with their assessment weight, date and time being set at the beginning of the semester via the course outline. Furthermore, individual design assignments as well as a group embedded system design project are used to develop practical engineering skills.
Bibliography	Textbook: ○ Dimitrios Serpanos and Marilyn Wolf, "**Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies**", Springer 2018 References: ○ Marilyn Wolf, "**Embedded System Interfacing: Design for the Internet-of-Things (IoT) and Cyber-Physical Systems (CPS)**", Morgan Kaufmann, 2019 ○ Mukhopadhyay, Subhas Chandra, " **Internet of Things: Challenges and Opportunities**", Springer 2014 ○ J. Rodrigues, P. Cardoso, J. Monteiro and C. Ramos, "**Smart Systems: Design, Applications, and Challenges**", IGI Global, 2020
Assessment	The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course. In order to continuously assess students, and given the mostly theoretical nature of the course, coursework weight is set at 40%, which comprises assignments and a mid-term exam. Assignments range from a short survey paper or case study, to simple design assignments that require demonstrate concept understanding as well as problem-solving skills. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below:

	• Assignments 20% • Test/quizzes: 20% • Final Exam: 60%
Language	English