Course unit title:	**Smart Grids and Control**				
Course unit code:	AEEE462				
Type of course unit:	Technical Elective				
Level of course unit:	Bachelor (2nd Cycle)				
Year of study:	4				
Semester when the unit is delivered:	8				
Number of ECTS credits allocated :	6	Lectures:	3	Labs:	
Name of lecturer(s):	Dr Marios Lestas				
Aim of the Course	The aim of the course is to introduce the basic concepts of various components of the smart grid and their impact on the energy industry. The primary objective is to learn the challenges facing the energy industry with respect to power systems and the smart grid and appreciate how control and optimization methods can be used to address these challenges. The course will start with basic principles of power systems, optimization and control methods and will cover topics such as renewable integration, demand side management and response, generation and distribution automation and advanced metering infrastructures.				
Learning outcomes of the course unit:	• Gain in-depth knowledge and understanding of the main principles underlying various components of the smart grid. • Learn challenges of the energy industry posed by the introduction of modern technologies such as renewable energy sources and electric vehicles. • Appreciate how control and optimization methods can be used to address these challenges. • Explain and apply the essential concepts and design principles of smart grid networks. • Describe the concepts and issues involved in developing, maintaining and managing a smart grid. • Use appropriate methods to pursue research or other detailed investigation of technical issues consistent with their level of knowledge and understanding.				
Mode of delivery:	Face-to-face				
Prerequisites:	None	Co-requisites:	None		
Course contents:	1. Introduction to Power Systems:				

	- Load and Generation - Distribution Systems, Transmission Lines - Power System Analysis 2. Introduction to Optimization and Control Methods - Basic Principles of Feedback Systems - Linear and Non-Linear Programming - Pricing Theory 3. Demand Side Management and Response - Definition, Application, State of the Art - Pricing and Energy Consumption Scheduling - Advanced Metering Infrastructures - Electric Vehicles and Vehicle-to-Grid Systems 4. Generation and Distribution Automation - Frequency Control - Voltage Control - Reactive Power Control 5. Renewable Integration - Renewable Sources: Wind and Solar - Microgrid Architecture - Tackling Intermittency - Distributed Storage and Reserves
Recommended and/or required reading:	
Textbooks:	James Momoh (2012) *Smart Grid: Fundamentals of Design and Analysis*, Wiley-IEEE Press, 1st Ed., ISBN: 978-0470889398.
References:	Ali Keyhani (2011), *Design of Smart Power Grid Renewable Energy Systems*, Wiley-IEEE Press, 1st Ed., ISBN: 978-0470627617.
Planned learning activities and teaching methods:	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Further literature search is encouraged by assigning students to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem and

	report this information in written or orally. 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. Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constraints and revision timetable. 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.
Assessment methods and criteria:	• Assignments 10% • Tests: 30% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No