Course unit title:	**Introduction to Renewable Energy Systems**		
Course unit code:	AEEE260		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	3		
Semester when the unit is delivered:	1 (Fall)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Antonis Papadakis		
Learning outcomes of the course unit:	1. Explain the basic concepts behind fuel cells. 2. Define the principles of hydrogen production. 3. Explain wind power technology. 4. Describe biomass and biofuel processes. 5. Explain the principles and fundamentals of photovoltaic generation. 6. Examine the basic concepts of wave power generation. 7. Understand the basic concepts of geothermal energy.		
Mode of delivery:	Face-to-face		
Prerequisites:	None	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	• **Photovoltaics Generation:** Introduction to Photovoltaic generation, The silicon p–n junction, Photon absorption at the junction, Solar radiation absorption, Maximising cell efficiency, Solar cell construction, Types and adaptations of photovoltaics, Photovoltaic circuit properties, Applications and systems, Social and environmental aspects. • **Wind Power:** Introduction to wind power, Turbine types and terms, Linear momentum and basic theory, Dynamic matching, Blade element theory, Characteristics of the wind, Power extraction by a turbine, Electricity generation, Mechanical power, Social and environmental considerations. • **Biomass and Biofuels:** Introduction to Biomass and Biofuels, Biofuel classification, Biomass production for energy farming, Direct combustion for heat, Pyrolysis (destructive distillation), Further thermochemical processes, Alcoholic fermentation, Anaerobic digestion for biogas, Wastes and residues, Vegetable oils and biodiesel, Social and environmental aspects • **Geothermal energy:** Introduction to Geothermal Energy, Geophysics, Dry rock and hot aquifer analysis, Harnessing Geothermal Resources • **Wave Power:** Introduction to Wave power, Wave motion, Wave energy and power, Wave patterns, Devices.		

	• **Fuel Cells:** Introduction to fuel cells, Electrochemical Cells, Fuel Cell Classification, Temperature of Operation, State of the Electrolyte, Type of Fuel, Chemical Nature of the Electrolyte, Fuel Cell Reactions, Alkaline Electrolytes, Acid Electrolytes, Molten Carbonate Electrolytes, Ceramic Electrolytes, Methanol Fuel Cells. • **Hydrogen Production:** Chemical Production of Hydrogen, Historical, Modern Production: a) Partial Oxidation, b) Steam Reforming, c) Thermal Decomposition, d) Syngas, e) Shift Reaction, f) Methanation, g) Methanol, h) Sycrude, Hydrogen Purification, Desulfurization, CO_2 Removal, CO Removal and Hydrogen Extraction, Hydrogen Production Plants, Compact Fuel Processors, Electrolytic Hydrogen, Introduction to Electrolyzer Configurations: a)Liquid Electrolyte Electrolyzers, b) Solid Polymer Electrolyte Electrolyzers, c) Ceramic Electrolyte Electrolyzers, Efficiency of Electrolyzes, Concentration Differential Electrolyzers, Electrolytic Hydrogen Compressors
Recommended and/or required reading:	
Textbooks:	• 3rd Edition, Fundamentals of Renewable Energy Processes, Aldo V. da Rosa, 2012, Elsevier Academic Press, ISBN: 0123972191/9780123972194.
References:	• Renewable Energy Resources, 3rd Edition, John Twidell and Tony Wier, Taylor & Francis, 2018, ISBN: 0419253300/9780419253303. • 5h Edition, Renewable Energy, Bent Sørensen, 3rd Edition, Academic Press, 2017, ISBN: 0123750253/9780123750259. • 2nd Edition, Renewable and Efficient Electric Power Systems, Gilbert M. Masters, John Wiley & Sons, 2013, ISBN: 1118140621/9781118140628.
Planned learning activities and teaching methods:	Teaching is based on lectures. The course delivery will be based on theoretical lecturing, assignments and exercises solved in class. Exercises will be handed to students and their solutions shall be analysed at lecture periods. Additional tutorial time at the end of each lecture will be provided to students. Students are expected to demonstrate the necessary effort to become confident with the different concepts and topics of the course.
Assessment methods and criteria:	• Assignments 10% • Tests: 30% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No