Course Title	Photovoltaic Technologies				
Course Code	ECE445				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year / Semester	4th Year / 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	The objective of this course is to expose students to renewable energy technologies and in particular, to the concept of photovoltaic technologies. The course presents the basic physical and operational aspects of photovoltaics and illustrates the important concepts in photovoltaic system engineering, design, sizing and component specifications. The evolution of the different photovoltaic technologies and global employment, are also demonstrated.				
Learning Outcomes	Upon successful completion of this course, students should be able to: • Examine the aspects of solar energy and its utilisation as a renewable source of energy • Analyse the operational principle and physical aspects of photovoltaic (PV) technologies • Define the different PV technologies • Design and analyse PV systems (grid-connected and stand-alone) • Assess the performance of PV systems • Utilise state-of-the-art computer software, to design PV systems and gain practical experience • Recognise the potential of PV as an alternative source of energy				
Prerequisites	ECE442	Co-requisites	None		
Course Content	Introduction: Overview of energy. Environmental and social threats. Energy crisis. Solar potential. Photovoltaic applications and market potentials. Photovoltaic technologies in Cyprus. Light: Properties of light. Photon description. The nature of solar radiation. Measuring solar radiation. Earth motion around the Sun. Solar radiation and orientation of PV technologies. Meteorological data representation (typical meteorological year). Sunlight optimization collection. Shading and PV energy yield. Semiconductor physics:				

	PV cell overview. Semiconductor structure and doping. Absorption of light. Current generation rate. Movement of carriers. P-N Junction diodes. Diode and current equations. PV cell: PV cell structure introduction. Collection probability Spectral response. Photovoltaic effect. Principle of operation and parameters. Effect of parasitic resistance. Effect of temperature. Effect of irradiance. Manufacturing and technologies: Basic design of photovoltaic technologies. Optical losses. Current losses. Voltage losses. PV manufacturing. PV cell technologies. Thin-film technologies. Tracking (single-, two-axis) technologies. Concentrator PV technologies. Third generation PV technologies. PV modules and arrays: PV module structure. PV module types. Module and array performance. Interconnection effects. Reasons for under-performance. PV system engineering: PV system structure. Markets and driving forces. PV system types. System design and sizing. System performance. Energy prediction. PV business and manufacturing costs.
Teaching Methodology	Face- to- face
Bibliography	S.R. Wenham, M.A. Green and M.E. Watt, Applied Photovoltaics. Earthscan M.A. Green, Solar Cells Operating Principles, Technology and System Applications, Earthscan F. Antonios, C. Durschner and K. Remmers, Photovoltaics for Professionals, Earthscan
Assessment	Examinations 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	English