

於。GDAŃSK UNIVERSITY 邱 OF TECHNOLOGY

Subject card

Subject name and code	Photovoltaic systems, PG_00037320								
Field of study	Technical Physics								
Date of commencement of studies	October 2020		Academic year of realisation of subject			2023/2024			
Education level	first-cycle studies		Subject group			Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery			at the university			
Year of study	4		Language of instruction			Polish			
Semester of study	7		ECTS credits			2.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Instytut Fizyki i Inforn	natyki Stosowa	nej -> Faculty o	of Applied Phys	sics and	Mather	matics		
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Justyna Szostak						
	Teachers		dr inż. Justyna Szostak						
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory Project		:t	Seminar	SUM	
of instruction	Number of study hours	15.0	0.0 0.0 15.0		15.0		0.0	30	
	E-learning hours inclu	uded: 0.0							
Learning activity and number of study hours	Learning activity	Participation in classes includ	n didactic led in study	Participation in consultation hours		Self-study		SUM	
	Number of study hours	30		2.0		18.0		50	
	 teach students how to design and properly locate PV systems, and how to assess their costs and cash flow teach students how to use the PVSOL premium software 								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K6_U06		The student is able to estimate the PV investment cost. Knows legal and other barriers (related to the functioning of the Energy Markets) hampering the calculation of profits and the payback period.			[SU3] Assessment of ability to use knowledge gained from the subject			
	K6_W01		The student knows the physical, economic, and ecological aspects of photovoltaic systems.			[SW3] Assessment of knowledge contained in written work and projects			
	K6_W12		The student knows basic health and safety regulations in the field of PV systems.			[SW3] Assessment of knowledge contained in written work and projects			
	K6_U04		Uses professional software to design and simulate the performance of a PV system. Knows how to optimize the system on the basis of the results of the simulations.			[SU4] Assessment of ability to use methods and tools			
	K6_W08		The student knows the elements of PV systems. Knows how to design and test the performance of such an installation. Knows how to analyze collected data.		[SW3] Assessment of knowledge contained in written work and projects				

Subject contents	properties of solar radiation relevant for photovoltaic applications					
	potential of photovoltaic installations in Poland, Europe and worldwide, with special emphasis on the potential of solar cell applications in Poland with respect to other EU countries					
	solar panel testing conditions and their effect on photovoltaic parameters of these devices					
	optimal solar panel tilt and azimuth angles depending on geographic location, season and climate					
	increase in total power production resulting from the use of tracking systems of various types					
	basic photovoltaic parameters of individual cells and photovoltaic modules					
	problems related to the operation of solar batteries - analysis of current-voltage characteristics of cells, modules and PV panels					
	- influence of external conditions (light intensity, temperature)					
	- consequences of connecting cells into circuits of different configurations (solar modules, panels and arrays)					
	- maximum power point tracking (MPPT)					
	- selection of a PV technology proper for a given external load					
	construction of PV modules - problems and methods of their elimination					
	the issue of partial shading of a PV installation and its influence on MPPT					
	other elements of on-grid photovoltaic systems and off-grid island installations:					
	- batteries - types, functions, construction, principles of operation, lifetime					
	- charge controllers - types, functions, charging methods and charging rates					
	- inverters - types, functions, construction, operation principles					
	- DC-DC converters					
	- external loads					
	- cabling					
	- security and mounting of PV modules and panels					
	- working conditions of PV installation components					
	- examples of devices available on the market and their estimated costs					
	proper selection of elements of stand-alone installations and on-grid systems					
	tools used to support the design process of photovoltaic power systems					

	design and cost-benefit analysis of on- and off-grid installations using appropriate software							
Prerequisites and co-requisites	Knowledge on photovoltaic effect and operating principles of inorganic solar cells.							
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade					
	project of a PV system	50.0%	100.0%					
Recommended reading	Basic literature	Ire Bogdan Szymański, "Instalacje fotowoltaiczne", Geosystem Shree Raj Shakya, Dinesh Kumar Sharma, Training Manua Engineers on Solar PV System, 2011 J.M. Pearce and R. Andews, Engineering Photovoltaic Systems Roger Messenger, Amir Abtahi, Photovoltaic Systems Engi						
	Supplementary literature	James P. Dunlop, NJATC, Photovoltaic Systems						
	eResources addresses	Adresy na platformie eNauczanie: Systemy fotowoltaiczne - Moodle ID: 34601 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34601						
Example issues/ example questions/ tasks being completed	Series and parallel connection of cells (modules, panels, arrays). Choice of modules suitable for the load. Maximum power point tracking. Module shading. Blocking and by-pass diodes.							
Work placement	Not applicable							