GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Bionics in energy sector, PG_00057272		
Field of study	Power Engineering		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Głuch	
	Teachers	dr hab. inż. Jerzy Głuch	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	15.0	45

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	45	6.0	49.0	100

Subject objectives

The aim of the course is to understand the basic concepts of bionics / biomimicry. Getting to know the possibilities and selected examples of technologies and solutions taken from living organisms. Awakening the ability to see and appreciate the evolutionary achievements of living organisms in the field of biological processes and their effective use for human needs, including energy. Explaining the nomenclature, scope and area of bionics as an interdisciplinary science.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] is able to use known mathematical and numerical methods to analyze and design elements, systems and power transmission networks and internal installations	Students are able to use the knowledge acquired during the course to design elements, systems and energy systems inspired by biological origin.	[SU4] Assessment of ability to use methods and tools
[K7_W03] knows advanced aspects of automation and automatic control of power systems or transmission networks and internal installations	Students know the advanced aspects of automation and automatic regulation of mechanical and energy systems.	[SW1] Assessment of factual knowledge
[K7_W02] has extended and deepened knowledge of physics, chemistry, thermodynamics, fluid mechanics, material science, necessary to understand and describe basic thermal and flow phenomena occurring in and around power equipment and systems, transmission networks and internal installations	Students have an extended knowledge needed to understand the mechanical and thermo-flow phenomena in bio-inspired energy systems.	[SW1] Assessment of factual knowledge

Subject contents

Outline, position and division of bionics. History of the development of bionics, examples and measurable effects of "imitating life". Methodology and modeling in bionics. Energy and bionic aspects. Structure and functions of biological systems. Principles of the functioning of living organisms and the possibility of their application in various areas of life, in science, technology and medicine. Bionics in innovative design of machines and devices. Examples of inventions inspired by nature. Descriptions of selected energy technologies viewed and downloaded from nature. Further directions of bionics development.

Prerequisites and co-requisites

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Presentation	100.0%	50.0%
	Test	50.0%	50.0%
Recommended reading	Basic literature	1. Heynert H. Bionika ogólna WNT Warszawa, 1975; 2. Tkacz E., Borys P. Bionika WNT Warszawa, 2006; 3. Morecki A., Ekiel J., Fidelus K. Bionika ruchu WNT Warszawa, 1971; 4. Benyus J. Innovation inspired by nature. Biomimicry Perennial. New York; 2002; 5. Samek A. Bionika wiedza przyrodnicza dla inżynierów Wyd. AGH, Kraków, 2010;	
	Supplementary literature	1. Morecki A. Manipulatory bioniczne WNT Warszawa, 1976; 2. Ayre M. Biomimicry A Review, 2004 ESTEC. 3. Samek A. (redakcja) Bionika w zagadnieniach technicznych : projekty koncepcyjne studentów V roku kierunku Automatyka i robotyka praca zbiorowa, Wydawnictwo PW, Wrocław, 2000.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Discuss bionic manipulators. Present bionic models of motion control systems. Discuss energy and bionic aspects.		
Work placement	Not applicable		