COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6"></td><td colspan="2">Degree level and programme type</td><td></td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td>Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Economy of Energy Consumption</td><td colspan="2">Course code</td><td>IS-FCEE 00109-1W</td></tr>
<tr><td colspan="2">Course type</td><td>Erasmus</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td colspan="2">Semestr</td><td>winter</td></tr>
<tr><td>15</td><td>-</td><td>-</td><td>15</td><td>-</td><td>-</td><td>-</td><td colspan="2">No. of ECTS credits</td><td>4</td></tr>
<tr><td>Entry requirements</td><td colspan="9">mathematics, physics, heat transfer</td></tr>
<tr><td>Course objectives</td><td colspan="9">This course introduces an elementary knowledge of environmental engineering for different, selected heat sources, their efficiency, investment and operating costs. Theoretical and empirical topics related to energy demand, energy supply, energy prices, environmental consequences of energy consumption and production Students understand the basic physical phenomena in the field of traditional and alternative heat sources. They know the basic knowledge, standards, guidelines and principles for the optimum design of heat preservation of heat sources based on biomass, heat pump and solar collector and from an economic point of view.</td></tr>
<tr><td>Course content</td><td colspan="9">Various types of traditional and renewable energy sources and their characteristics. Useful energy, final energy and primary energy, partial efficiency of the heating system. Selected methods of heat saving. Performing a technical and economic analysis of selected types of heating systems (traditional sources and solar collectors, PV, heat pumps)</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Lecture, project.</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture - written exam, performing the analysis (project)</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>EU1</td><td colspan="7">The student understands the issues of mathematics, physics and chemistry at an advanced level, which are the basis of the processes taking place in environmental engineering</td><td colspan="2">EC1_W02</td></tr>
<tr><td>EU2</td><td colspan="7">The student knows and understands the basic methods of analysis and modeling of thermal processes in alternative</td><td colspan="2">EC1_W07</td></tr>
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	energy sources	
EU3	Properly select and use the known methods and tools, including advanced information and information, numerical, simulation and experimental techniques when solving complex engineering problems based on alternative energy sources	EC1_U05
EU4	Plan and conduct experiments, including measurements of the physical quantities of devices used in alternative energy sources	EC1_U07
EU5	Explaining cognitive and practical problems, consulting experts in cases of difficulties in solving them on their own.	EC1_K03
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
EU1	lecture written examination, project defense	L, P
EU2	lecture written examination, project defense	L, P
EU3	project defense	P
EU4	observation of work on exercises, project defense	P
EU5	observation of work on exercises, project defense	P
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	15
	preparation for analyses	15
	design classes	15
	participation in student-teacher sessions related to the project	15
	implementation of the project	20
	preparation for and participation in exams	20
	TOTAL:	**100**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**45**	**2**
Student workload – practical activities	**50**	**2**

Basic references	1. Energy Economics, Wei Hua Liao, Emerald, 2018. 2. Zweifel P., Praktiknjo A., Erdmann G.,Energy Economics: Theory and Applications, Springer Berlin, 2017. 3. Bhattacharyya, Subhes C, Energy Economics: Concepts, Issues, Markets and Governance, Springer London, 2011.
Supplementary references	1. Energy Economics,, Netherlands North-Holland, ISSN: 0140-9883 (magazine). 2. Napoleon Enteria, Aliakbar Akbarzadeh, Solar energy sciences and engineering applications, Boca Raton : CRC/Taylor & Francis, 2014. 3. Shah, Yatish T., Thermal energy : sources, recovery, and applications, CRC/Taylor & Francis, 2018.

Organisational unit conducting the course	**HVAC Departmen**	**Date of issuing the programme**
Author of the programme	**dr inż. Piotr Rynkowski**	**25.03.2021**

L – lecture, C –classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S –seminar