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="5"></td><td colspan="2">Degree level and programme type</td><td colspan="2"></td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="5"></td><td colspan="2">Study profile</td><td colspan="2">Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="5" rowspan="2">Alternative Energy Sources</td><td colspan="2">Course code</td><td colspan="2">IS-FCEE-00105-1W/S</td></tr>
<tr><td colspan="2">Course type</td><td colspan="2">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 colspan="2">Winter/Summer</td></tr>
<tr><td>15</td><td>-</td><td>30</td><td>15</td><td>-</td><td>-</td><td>-</td><td colspan="2">No. of ECTS credits</td><td colspan="2">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 alternative energy sources. Students understand the basic physical phenomena in the field of alternative energy sources They know the basic knowledge, standards, guidelines and principles for the design of heat sources based on biomass, heat pump and solar collector.</td></tr>
<tr><td>Course content</td><td colspan="9">Vvarious types of renewable energy sources. Solar Radiation. Flat Plate And Concentrating Collectors. Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications. Types of Wind Energy Systems. Principles of Bio-Conversion. Heat pumps, resources, types of wells.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Lecture, laboratory classes, project.</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture - written exam, laboratory - assessment of reports, preparation tests for exercises</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 energy sources</td><td colspan="2">EC1_W07</td></tr>
<tr><td>EU3</td><td colspan="7">Properly select and use the known methods and tools, including advanced information and information, numerical, simulation and experimental techniques when solving complex engineering</td><td colspan="2">EC1_U05</td></tr>
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	problems based on alternative energy sources	
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, defense exercise design	L, P
EU2	lecture written examination, defense exercise design	L, P
EU3	defense exercise design	P, LC
EU4	observation of work on exercises, exercise design	P, LC
EU5	observation of work on exercises, exercise design	P, LC
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	15
	participation in laboratory classesand project	45
	preparation for reports	15
	work on reports	15
	participation in student-teacher sessions related to the reports	20
	implementation of reports	10
	preparation for and participation in exams	10
	TOTAL:	**115**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload –activities that require direct teacher participation	**55**	**2**
Student workload –practical activities	**55**	**2**

Basic references	1. Hodge B.K., Alternative energy systems and applications, Hoboken : John Wiley a. Sons, 2017. 2. Shah, Yatish T., Thermal energy : sources, recovery, and applications, CRC/Taylor & Francis, 2018. 3. Zheng, Hongfei, Solar energy desalination technology, Amsterdam : Elsevier, 2017. 4. Gevorkian P.: Large-scale solar power system design : an engineering guide for grid-connected solar power generation, New York : McGraw-Hill, 2011.
Supplementary references	1. Napoleon Enteria, Aliakbar Akbarzadeh, Solar energy sciences and engineering applications, Boca Raton : CRC/Taylor & Francis, 2014. 2. Bin W. [et al], Power conversion control of wind energy systems, Hoboken : IEEE Press : John Wiley a. Sons, 2011. 3. Gevorkian P.: Alternative energy systems in building design, New York : McGraw-Hill, 2010.

Organisational unit conducting the course	**HVAC Departmen**	**Date of issuing the programme**
Author of the programme	**dr inż. Tomasz Teleszewski** **dr inż. Piotr Rynkowski**	**18.03.2021**

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