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">Environmental Engineering</td><td colspan="2">Degree level and programme type</td><td>Master's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td></td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Alternative Energy Sources</td><td colspan="2">Course code</td><td>IS-FCEE-00105-1W</td></tr>
<tr><td colspan="2">Course type</td><td></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">Semester</td><td></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>4</td></tr>
<tr><td>Entry requirements</td><td colspan="9">mathematics, physics, heat exchange</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">Obtain knowledge of various types of renewable energy sources. Identify the locations where opportunities exist for tapping renewable energy sources.Understanding the different areas where the conventional energy sources can be replaced or supplemented by alternative energy sources, as solar energy, wind energy, tidal energy, bio-energy and ground energy.</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>LO1</td><td colspan="7">understand the basic physical phenomena in the field of alternative energy sources</td><td colspan="2">K_W02</td></tr>
<tr><td>LO2</td><td colspan="7">has an elementary knowledge of environmental engineering for alternative energy sources</td><td colspan="2">K_W03</td></tr>
<tr><td>LO3</td><td colspan="7">know the basic knowledge, standards, guidelines and principles for the design of heat sources based on the heat pump</td><td colspan="2">K_W016</td></tr>
<tr><td>LO4</td><td colspan="7">able to work independently and in a team</td><td colspan="2">K_U03</td></tr>
<tr><td>LO5</td><td colspan="7">able to prepare and present a presentation of the results of working with tasks related to the possibility of using alternative energy sources</td><td colspan="2">K_U04</td></tr>
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LO6	able to integrate the information, make their interpretation and critical evaluation	K_U01
LO7	applies the principles of health and safety	K_U12
LO8	familiar with the need to constantly improve the skills	K_01
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	lecture written examination, defense exercise design	L
LO2	lecture written examination, defense exercise design	L
LO3	defense exercise design	L,P
LO4	observation of work on exercises, exercise design	LC
LO5	defense exercise design	L,P
LO6	observation of work on exercises	LC,P
LO7	observation of work on exercises	LC
LO8	observation of work on exercises	LC
Student workload (in hours)		No. of hours
Calculation	lecture attendance	15h
	participation in laboratory classes and project	45h
	preparation for reports	15h
	work on reports	15h
	participation in student-teacher sessions related to the reports	20h
	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. Sukhatme S.P: Solar Energy, Principles of Thermal Collection and Storage, Tata Mc Graw Hill Publishers, Fourth Print, February 1989. 2. Kalogirou S.: Solar energy engineering : processes and systems, Amsterdam : Academic Press, 2009. 3. Gevorkian P.: Large-scale solar power system design : an engineering guide for grid-connected solar power generation, New York : McGraw-Hill, 2011. 4. Aldo Vieira da Rosa: Fundamentals of renewable energy processes, Amsterdam, 2009. 5. Gipe P.: Wind power : renewable energy for home, farm, and business, White River Junction : Chelsea Green Publishing Company 2004
Supplementary references	1. Gevorkian P.: Alternative energy systems in building design, New York : McGraw-Hill, 2010. 2. Energy from the Wind, Putnam, Prentice Hall of India,2004. 3. Rai G.D.:Non-Conventional Energy Sources, Khanna Publishers.2000.

	4. Hsieh J.S.: Solar energy engineering, Prentice-Hall, 1986, 5. Cheremisinoff N.P.: Fundamentals of wind energy, Ann Arbor, 1980.	
Organisational unit conducting the course	HVAC Department	Date of issuing the programme
Author of the programme	dr inż.Tomasz Teleszewski dr inż. Piotr Rynkowski	30.10.2020

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