MODULE SPECIFICATION

Module code	
Module title in Polish	Energetyka odnawialna
Module title in English	Renewable Power Engineering
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Environmental Engineering
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	Sanitary Pipelines and Systems; Water Supply, Treatment of Wastewater and Solid Waste
Organisational unit responsible for module delivery	Department of Piped Utility Systems
Module co-ordinator	Łukasz Orman, PhD hab., Eng.
Approved by:	Prof. Andrzej Kuliczkowski, PhD hab., Eng.

B. MODULE OVERVIEW

Module type	programme-specific module (core/programme-specific/elective HES*)
Module status	optional module (compulsory/optional)
Language of module delivery	**Polish/English**
Semester in the programme of study in which the module is taught	semester 3
Semester in the academic year in which the module is taught	winter semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	No (Yes/No)
ECTS credits	1

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15				

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to learn the issues of renewable energy, the applied technical solutions as regards generating energy on the basis of particular renewable energy resources (as well as economic and ecological conditions of various solutions).

Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student knows the role and method of utilising energy (including waste energy).	l	IŚ_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows the potential, the possibilities of utilising and economic conditions of renewable energy resources.	l	IŚ_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows the technologies of energy production from renewable resources, i.e. biomass, water, wind, the Sun, and Earth's interior.	l	IŚ_W08 IŚ_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can make simple calculations connected with generating energy from renewable resources.	l	IŚ_U09 IŚ_U19	T1A_U01 T1A_U03 T1A_U04 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_02	A student can demonstrate the necessity of applying renewable energy resources.	l	IŚ_U09	T1A_U01 T1A_U04 T1A_U10
K_01	A student can formulate conclusions and describe the results of the obtained work.	l	IŚ_K07	T1A_K07
K_02	A student understands the meaning of the technological progress	l	IŚ_K09	T1A_K02

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Introductory issues: the role of energy in the development of mankind, the rationalisation of energy use and its accumulation.	W_01 U_02 K_01 K_02

2.	The potential and possibilities of practical use of renewable energy resources.	W_02 U_02 K_02
3.	The technologies of renewable energy: water and wind.	W_03 U_01 K_02
4.	The technologies of renewable energy: photovoltaic cells and solar collectors.	W_03 U_01 K_02
5.	The technologies of renewable energy: biomass and geothermal energy.	W_03 U_01 K_02
6.	The utilisation of waste energy.	W_02 U_01 K_02
7.	Economic conditions and perspectives of developing renewable energy.	W_02 U_02 K_02

Assessment methods

Module outcome code	**Assessment methods** *(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)*
W_01	A test
W_02	A test
W_03	A test
U_01	A test
U_02	A test
K_01	A test
K_02	Discussion with students during lecture

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**15**
2	Contact hours: participation in classes	
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**3**
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	**Number of contact hours**	**18** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**0.72**
11	Private study hours: background reading for lectures	**3**

12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**4**
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	
18	Private study hours: preparation for an examination	
19		
20	**Number of private study hours**	**7** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**0.28**
22	**Total study time**	**25**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**1**
24	**Number of practice-based hours** *Total practice-based hours*	
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	

E. READING LIST

References	1. Glassley W.E., Geothermal energy: renewable energy and the environment, Boca Raton: CRC Press, cop. 2010. 2. Solar and Wind Technology: an international journal, Oxford : Pergamon Press Ltd., 1984-1990. 3. Modelling and elaboration of renewable energy sources and energy storage systems: workshop, September 14, 2004, Oficyna Wydawnicza Politechniki Wrocławskiej, Poland. 4. Kreith F., Goswami D.Y., Handbook of energy efficiency and renewable energy, Boca Raton: CRC Press: Taylor & Francis Group, cop. 2007. 5. Freris L., Infield D., Freris L., Renewable energy in power systems, Chichester: John Willey & Sons, cop. 2008. 6. SØrensen B., Renewable energy conversion, transmission and storage, Amsterdam: Elsevier/Academic Press, cop. 2007. 7. Renewable Energy: an international journal, Oxford: Pergamon Press Ltd., 1991. 8. Simoes M.G., Farret F.A., Renewable energy systems: design and analysis with induction generators, Boca Raton: CRC Press, cop. 2004. 9. Godfrey Boyle, Renewable energy: power for a sustainable future, Oxford: Oxford University Press: The Open University, 2004. 10. Nowak-Woźny D., Maria Mazur M., Imriš I. et al., Some aspects of renewable energy, Wrocław: Oficyna wydawnicza Politechniki Wrocławskiej, 2011. 11. Fanchi J.R., Energy: Technology and Directions for the Future, Elsevier, 2004. 12. Hinrichs R.A., Kleinbach M., Energy: its use and the environment, Brooks/Cole, 2002. 13. Duffie J.A., Beckman W.A., Solar Engineering of Thermal Processes, John Wiley & Sons Inc, 2006. 14. Markvart T., Castaner L., Practical Handbook of Photovoltaics, Fundamentals and Applications, Elsevier, 2003.
Module website	