

**Course name: Renewable Energy Sources in Rural Areas**

ECTS	6.0
Course status	<i>facultative</i>
Course final assessment /evaluation of outcomes	<i>Exam / graded credit</i>
Prerequisite	<i>Basics of physics</i>

**Main field of study: Environmental Engineering**

Educational profile	<i>General academic</i>
Code of studies and education level	<i>master of thesis</i>
Semester of studies	<i>winter or summer</i>
Language of instruction	<i>English</i>

**Course offered by:**

Name of faculty offering the course	Environmental Engineering and Land Surveying
Name of department offering the course	Department of Rural Building
Course coordinator	Jan Radoń, Ph.D., Agnieszka Sadłowska, Ph.D.

**Learning outcomes:**

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
<b>KNOWLEDGE – student knows and understands:</b>			
RES_K1	<i>how to use the solar (thermal and photovoltaic), hydroelectric, wind, geothermal energy, as well as energy from biomass; issues relevant to energy efficiency and energy storage; the potential of using renewable energy technologies as a complement to, and, to the extent possible, replacement for conventional technologies; economical, social, environmental and political conditions as well as strategies for enhancing the future use of renewable energy resources.</i>	<i>IS2_W05 IS2_W12 IS2_W17</i>	<i>T</i>
<b>SKILLS – student is able to:</b>			
RES_S1	<i>design and calculate parameters of systems absorbing and transforming renewable energy.</i>	<i>IS2_U05 IS2_U11</i>	<i>T</i>
<b>SOCIAL COMPETENCIES – student is ready to:</b>			
RES_C1	<i>correctly identify and resolve dilemmas related to engineering activities and is aware of the importance of social and ethical aspects in this activity</i>	<i>IS2_K04</i>	<i>T</i>

**Teaching contents**

Lectures:		15 hours
Topics	<ol style="list-style-type: none"> <li>1. Solar Thermal Energy (3 hours).</li> <li>2. Photovoltaics (2 hours).</li> <li>3. Wind Energy (2 hours).</li> </ol>	

	<ol style="list-style-type: none"> <li>4. Biomass (2 hours).</li> <li>5. Hydropower (2 hours).</li> <li>6. Wave Energy (2 hours).</li> <li>7. Geothermal Energy (2 hours).</li> </ol>
Accomplished learning outcomes	RES_K1, RES_C1
Means of verification, rules and criteria of assessment	Single-choice test, positive assessment should be given at least 50% of correct answers to given questions: <50% – insufficient (2.0); 50–60% – sufficient (3.0); 61–70% – satisfactory plus (3,5); 71–80% – good (4.0); 81–90% – good plus (4,5); 91–100% – very good (5.0). The share of the lecture grade in the final grade is 50%.
Seminars:	30 hours
Topics	<ol style="list-style-type: none"> <li>1. Design and basic energy and economy calculations of solar system for water heating.</li> <li>2. Technical and economical analysis of photovoltaic's facility on the basis of exemplary case.</li> <li>3. Analysis of economical and environmental impact of wind farm based on polish and EU examples.</li> <li>4. Analysis of substitution of traditional energy sources with biomass for heating of house in rural areas. Applying of "BIOB Calculator" software for calculations.</li> <li>5. Visit to hydropower plant.</li> <li>6. Visit to geothermal plant/facility.</li> <li>7. Review, quiz.</li> </ol>
Accomplished learning outcomes	RES_S1
Means of verification, rules and criteria of assessment	Passing quiz – a grade from exercises is an arithmetic average of formative grades. The share of the grade for the project exercises in the final grade of the subject is 50%.

#### References:

Basic	<ol style="list-style-type: none"> <li>1. Solway A. 2009. <i>Renewable Energy Sources</i>. Heinemann-Raintree Inc., USA, pp. 223.</li> <li>2. Kemp W., H. 2006. <i>The Renewable Energy Handbook</i>. Aztext Press, USA, pp. 321.</li> <li>3. Craddock D. <i>Renewable Energy Made Easy</i>. Atlantic Publishing Group, Inc., USA, pp. 287.</li> </ol>
Supplementary	<ol style="list-style-type: none"> <li>1. Wengenmayr R., Bührke Th. 2013. <i>Renewable Energy: Sustainable Concepts for the Energy Change</i>, Wiley-VCH Verlag GmbH &amp; Co. KGaA, Weinheim.</li> <li>2. <i>Renewable Energy</i>. ICAR e-Course for B.Sc (Agriculture) and B. Tech (Agriculture) (<a href="http://www.Agrimoon.Com">www.Agrimoon.Com</a>)</li> <li>3. Zoba A. F., Bansal R. 2011. <i>Handbook of renewable energy technology</i>, World Scientific Publishing.</li> </ol>

#### Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	0.0 ECTS **
Area of academic study: T – technical sciences	6.0 ECTS**

**Structure of student activity**

Contact hours	57	hrs.	2.3	ECTS**
Including: lectures	15	hrs.		
classes and seminars	30	hrs.		
consultations	10	hrs.		
participation in research	0	hrs.		
obligatory traineeships	0	hrs.		
participation in examination	2	hrs.		
e-learning	0	hrs.	0.0	ECTS**
student own work	93	hrs.	3.7	ECTS**

\*Areas of academic study in the fields of: A – the arts; H – humanities; M – medical, sport and health sciences; N – natural sciences; P – biological sciences; R – agricultural, forestry and veterinary sciences; S – social studies; T – engineering and technology

\*\* stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25–30 hours of classes