

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Elektrownie wodne 1**  
 Name in English: **Water Power Plants 1**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable): **Renewable Energy Systems**  
 Level and form of studies: **2nd level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ELR052332**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30				
Number of hours of total student workload (CNPS):	60				
Form of crediting:	crediting with grade				
For group of courses mark (X) final course:					
Number of ECTS points:	2				
including number of ECTS points for practical (P) classes :					
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40				

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Has knowledge for the selection of electrical low voltage installation and equipment in normal and fault conditions
2. He can read the design intent
3. He can able to make use of regulations and norms
4. He can use basic computer hardware and software
5. He can work in group and understand the needs of recurrent self education.

**SUBJECT OBJECTIVES**

- C1. To make student acquaintance with rules of design, built and exploitation of hydro power station  
 C2. To make student acquaintance with basic rules of hydro power station control.  
 C3. To make student acquaintance with legal and economy analysis required for the design of small hydro power station.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 He has knowledge of the classification and construction of hydroelectric power plants.  
 PEU\_W02 He has knowledge about the principles for the design and operation of hydroelectric power plants.

*relating to skills:**relating to social competences:*

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Introduction to subject, programme, requirements and way of testing. Introduction: general definition, classification of hydro power stations, European drivers of SHP development, state of the hydro-energy in Europe and Poland.	2
Lec 2	Water and energy potential: analysis of water resources and production: hydrological parameters river basin, electrical power and energy, flow duration curves.	2
Lec 3	Types and characteristics of the SHP: hydraulic structures, hydro-technical equipment,	2
Lec 4	Types and characteristics of the SHP: basic turbine types of, turbine technology and parameters.	2
Lec 5	Types and energy parameters of the turbines: Pelton, Banki-Michell, Kaplan,	2
Lec 6	Types and energy parameters of the turbines: Francis, Kinetic turbines; electrical diagrams	2
Lec 7	Automation and control of hydro power: Introduction to hydro power control, control of hydro power in electro-energy system.	2
Lec 8	Control of turbines.	2
Lec 9	Voltage control of in hydro power stations	2
Lec 10	Protection, tests, exploitations remarks.	2
Lec 11	Project analysis of hydro power stations: analysis of hydrological potential of the site, turbine choice, selection of generator, automation and protection.	2
Lec 12	Project analysis of small hydro power stations: Economy and Financing.	2
Lec 13	Water Law, Environment, Research & Development	2
Lec 14	Practical examples, good practice cases.	2
Lec 15	Summary of lectures and classification	2
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Lecture using audio video techniques, multimedia presentations, foliograms.
N2. Knowledge checking in written and unwritten form

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F – forming (during semester) P – concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEU_W01 PEU_W02	Written test or checking messages in the oral form
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] Stawski P., Herlender K., Bobrowicz W., Water Power Plants, Wrocław University of Technology, Wrocław 2011.
<b>SECONDARY LITERATURE:</b> [1] Bobrowicz W., Small Hydro Power – Investor Guide Leonardo Energy, Utilisation Guide Section 8 – Distributed Generation, Autumn 2006. [2] Harvey A., Micro-hydro power, 2004. [3] Shannon R., Water Wheel Engineering. 1997. [4] Allan. Undershot, Water Wheel. 2008. [5] Damazy Laudyn, Maciej Pawlik, Franciszek Strzelczyk: Elektrownie, WNT, Warszawa 2007. [6] Kremens Z., Sobierajski M.: Analiza systemów elektroenergetycznych, WNT, Warszawa 1996. [7] Jackowski K.: Elektrownie wodne, WNT, Warszawa 1971. [8] Kacejko P.: Generacja rozproszona w systemie energetycznym. Wyd. PL, Lublin 2004. [9] Marian Hoffman, Małe elektrownie wodne – poradnik, Wydawnictwo Nabba, Warszawa 1992 r.

SUBJECT SUPERVISOR
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