

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Elektrownie wodne 2**
 Name in English: **Water Power Plants 2**
 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: **ELR052336**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):					15
Number of hours of total student workload (CNPS):					30
Form of crediting:					crediting with grade
For group of courses mark (X) final course:					
Number of ECTS points:					1
including number of ECTS points for practical (P) classes :					1
including number of ECTS points for direct teacher-student contact (BK) classes:					0.70

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:**relating to skills:*

- PEU_U01 Is able to pre-design basic elements of small of hudro power stations.
 PEU_U02 Is able to law adn economy analysis inthe proces of small hydro power station design.
 PEU_U03 Is able to prepare report concerning design, building and exploitation of hydro power station.

relating to social competences:

- PEU_K01 Has cognisance of responsibility for his work and is ready to compliance of the team work rules.

PROGRAMME CONTENT		
Form of classes - seminar		Number of hours:
Sem 1	Discussion of problematic aspects of seminar, the way of realisation, the way of programme, requirements and way of classification.	1
Sem 2	Dispensing of assumptions of SHP projects using software provided by attending person - team work.	2
Sem 3	Reports from the scope: Analysis of water potential, hydrological parameters of rivers and basins, electrical power and energy, flow duration curves.	2
Sem 4	Reports from the scope: Types and characteristics of the SHP: hydraulic structures, hydrotechnical equipment, basic turbine types of, turbine technology and parameters	2
Sem 5	Reports from the scope: Automation and control of hydro power: introduction to hydro power control, control of hydro power in electro-energy system, control of turbines, voltage control of in hydro power stations, protection, tests, exploitations remarks.	2
Sem 6	Reports from the scope: Project analysis of small hydro power stations (SHP): analysis of hydrological potential of the site, turbine choice, selection of generator, automation and protection; economy and financing, feasibility study	2
Sem 7	Reports from the scope: Water Law, Environment, Research & Development, practical examples, good practice cases.	2
Sem 8	Summary of seminar and classification.	2
Total hours:		15

TEACHING TOOLS USED
N1. Seminar - preparing and giving a speech reports N2. Knowledge checking in written and unwritten form N3. Preparing of the initial SHP project in teams.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(s)	PEU_U01 PEU_U02 PEU_K01	Evaluation of the pre-project of-SHP- teamwork
F2(s)	PEU_U03 PEU_K01	Evaluation of the paper, developed and delivered by each student
P(s)	P=0.5 F1 + 0.5 F2	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Stawski P., Herlender K., Bobrowicz W., Water Power Plants, Wrocław University of Technology, Wrocław 2011.
SECONDARY LITERATURE: [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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