

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Electric power systems and energy management</b>		Code <b>1010311441010305640</b>
Field of study <b>Power Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>2 / 4</b>
Elective path/specialty <b>-</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>15</b> Classes: <b>-</b> Laboratory: <b>-</b> Project/seminars: <b>15</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art		ECTS distribution (number and %)
<b>Responsible for subject / lecturer:</b>  dr inż. Radosław Szczerbowski email: radoslaw.szczerbowski@put.poznan.pl tel. 61 665 20 30 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Basic knowledge about electrical engineering, energy machinery, and thermodynamics. Basic knowledge about economics.
2	<b>Skills</b>	Skills to use mathematics and computing methods to perform simple calculations simulation. Ability to use economic knowledge in practice.
3	<b>Social competencies</b>	Is aware of the need to expand their competence, ability to work in a team
<b>Assumptions and objectives of the course:</b> Familiarize with the general principles and conditions of the energy economy, in its technical aspects, economic and legal. Ability to assess the energy situation of the World and Polish. Understanding of the workings of the energy market. Assessment of energy consumption in the manufacturing process. Provide general principles for energy efficiency. Linking knowledge of the economics of energy and enterprise. Knowledge of electrical power distribution systems for electrical networks, substations and switchgear.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Has a basic and structured knowledge of electrical distribution systems, the nature and criteria selection of switchgear - [K_W06+K_W12++]		
2. He has knowledge of the role and importance of energy in the economy of the country, about the size of energy resources and how to use them, taking into account the structure of the energy system generation. Know the characteristics of the different energy sectors: electricity and heating system. - [K_W07+K_W18+K_W22+++]		
3. Knows the structure of the national energy system and subsystems, knows the rules of rational energy conversion processes and use of energy - [K_W11+K_W24+K_W13++]		
<b>Skills:</b>		
1. Student is able to estimate the demand for electricity - [K_U20+++]		
2. Student is able to balance the various energy facilities in accordance with the principles of rational use of energy - [K_U12+K_U20++K_U22++]		
3. Has the ability to solve practical problems in the energy sector - [K_U18++K_U19++]		
<b>Social competencies:</b>		
1. Is aware of the responsibility for jointly implemented tasks - [K_K03 ++]		

<b>Assessment methods of study outcomes</b>	
<p>Lecture - evaluation of knowledge and skills listed on the written exam of a problematic (student may use any teaching materials), or test, continuous evaluation for each course (rewarding activity and quality perception).</p> <p>Tutorials: test (at 14 weeks) and favoring the knowledge necessary to carry out the questions posed in the task area exercises, continuous evaluation for each course.</p> <p>Laboratory: continuous evaluation for each course - rewarding gain skills they met the principles and methods evaluation knowledge and skills related to the implementation of the tasks your practice, the assessment report on performed exercise.</p>	
<b>Course description</b>	
<p>Lecture: The role of energy in human development. Rationalization of energy use. Material and energy balances. General information about the role and importance of energy in the economy of the country, about the size of energy resources, taking into account the structure of the national system of energy generation.</p> <p>A national energy system and its subsystems: solid fuels, liquid fuels, gas system, electricity, heat system. Environmental risks in the process of acquisition and conversion of energy and how energy environmental threats. Ways of green energy state. Combined heat and power economy. The accumulation of energy. Rules for the use of waste energy. Energy market segments: fuel, electricity, heat. Natural monopoly. Legal in energy trading. Authority control. The nature and elements of the electricity market. Marketplace of electricity. Practical ways of balancing energy conversion systems, the technical options for the production of heat and electricity in a power plant and power plants, energy auditing issues.</p> <p>Basic concepts of power and energy, load charts, fuel properties and principles of various types of fuel economy.</p> <p>Power distribution systems in industrial plants and utilities for customers. Supply categories: industrial and municipal customers. Design solutions substations and MV switchgear. The criteria and the basic rules for the selection of cables and electrical apparatus.</p> <p>Exercise: Forecasting the domestic demand and the price of fuel and energy. Economic conditions of construction and operation of energy sources. Investment performance indicators. Auditing energy. Energy recovery and utilization of waste energy.</p> <p>Calculation of fuel economy. Calculation of technical and operational and economic impacts of various energy facilities: conventional steam thermal power plants, nuclear power plants, gas turbine power plants, small decentralized systems, including the associated heat generation and transmission systems for electricity, heat and gas. The variability of the power system loads - daily, weekly, monthly and yearly.</p> <p>Laboratory thematically related to the subject of the lectures.</p>	
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Markiewicz H.: Urządzenia elektroenergetyczne, WNT, Warszawa, 2001.</li> <li>2. Periodyki: Elektroinstalator, Elektroinfo</li> <li>3. Katalogi firmowe i informacje internetowe</li> <li>4. Mejro C., Podstawy gospodarki energetycznej, WNT, 1980</li> <li>5. Niedziółka D., Rynek energii w Polsce, Difin, 2010</li> <li>6. Soliński I., Ekonomia i organizacja sektorów systemu paliwowo-energetycznego. Uczelniane Wydawnictwa Naukowo-Dydaktyczne. 2000</li> <li>7. Górzyński J., Audyting energetyczny. NAPE S.A. 2002</li> <li>8. Laudyn D., Rachunek ekonomiczny w elektroenergetyce, Oficyna Wydawnicza Politechniki Warszawskiej, 1997</li> <li>9. Góra S., Gospodarka elektroenergetyczna, Wydawnictwo Uczelniane politechniki Poznańskiej, 1973</li> <li>10. Pawłęga A. Rachunek ekonomiczny w elektroenergetyce. Oficyna Wydawnicza Politechniki Warszawskiej, 2011</li> <li>11. Charun H., Podstawy gospodarki energetycznej. Wydawnictwo Uczelniane Politechniki Koszalińskiej. 2007</li> <li>12. Ziębik A., Szargut J., Podstawy gospodarki energetycznej, Wyd. Politechniki Śląskiej, 1997</li> </ol>	
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Szargut J., Ziębik A., Podstawy energetyki ciepłej, PWN</li> <li>2. Kuciński K., Energia w czasach kryzysu, DIFIN, 2006</li> </ol>	
<b>Result of average student's workload</b>	
Activity	Time (working hours)

1. participation in lectures	15	
2. exam preparation	20	
3. presence on the exam	5	
4. the consultation of project	5	
5. participation in project	15	
6. preparation to project exercises	5	
7. development of project reports	15	
8. the consultation of the project	5	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	85	3
Contact hours	45	2
Practical activities	40	2