

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Fundamentals of electric power engineering</b>		Code <b>1010311441010310052</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>30</b> Classes: <b>15</b> Laboratory: <b>15</b> Project/seminars: <b>-</b>		No. of credits <b>5</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 hab. inż. Ryszard Frackowiak, prof. nadzw. email: ryszard.frackowiak@put.poznan.pl tel. 61 6652294 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		<b>Responsible for subject / lecturer:</b> dr inż. Jerzy Andruszkiewicz email: jerzy.andruszkiewicz@put.poznan.pl tel. 61 665 2282 Wydział Elektryczny ul. Piotrowo 3A, 60-965 Poznań
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Basic knowledge in mathematics, physics and electrical engineering, mainly on AC circuits calculations.
2	<b>Skills</b>	General-level programming skills and effective self-education skills concerning the domain related to the chosen direction of studies.
3	<b>Social competencies</b>	Is aware of the need to widen his competences and to undertake the team cooperation.
<b>Assumptions and objectives of the course:</b> Getting basic knowledge on the electric power system, structure of its fundamental components (lines and transformers), its operating condition analysis, as well as on the electrical grid's design, construction and computing.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. Has acquired elementary knowledge on basic regulations within the electric power system and control of the small hydropower plants cooperating in the micro-grids. - [K_W07+] 2. Has acquired elementary knowledge on modeling and analysis of the simple transmission systems and power supply networks as well as on the power sources balance in the electric power system. - [K_W11++]		
<b>Skills:</b> 1. Can choose elements of the measuring system and the power and energy consumption control system in the selected electrical energy supply systems - [K_U10 +] 2. Can apply the rules of rational electric power management related to the selected production process - [K_U20+]		
<b>Social competencies:</b> 1. Is aware of the engineer's responsibility for his actions and for the tasks carried out in the team co-operation. - [K_K04 +]		
<b>Assessment methods of study outcomes</b>		

<p>--Lecture          ?Assessment of knowledge and skills presented in the exam,          ?Continuous grading, at each section (Bonus for activity and perception quality)          -Sections          ?Continuous grading, at each section ? bonus for involvement and preparation to the class activities,          ?Test in writing in 14th week          -Lab sections:          ?Test and bonus for knowledge necessary to deal with the indicated problems,          ?Continuous assessment ? at each class ? bonus for increase in skills of dealing with acquired rules and methods          ?Assessment of knowledge and skills related to the lab experiments run, grading of the report from the carried-out lab experiments,          -Acquisition of additional marks for in-class activity, especially for:          ?Effective application of acquired knowledge when solving the indicated problem;          ?Cooperation skills within the team carrying out the specific lab task;          ?Accuracy and esthetic form of the report prepared in the framework of the individual work.</p>	
<b>Course description</b>	
<p>-General characteristics of electric power system operation; structure of the overhead- and cable electric power lines, modeling of the system?s basic elements, calculation of the power flow and short-circuit currents in the electric power grid, power and energy losses, basic system regulations, Reactive power compensation, structure and operation of electric power transformer, transformer?s insulation and cooling systems, bushing insulator.          Lecture with multimedia-based presentation and student-oriented questions/inquiries harking back to the content of other courses.          Update 2017: Electric energy market fundamentals, contract-based use of the electric power system, basic questions of the transformers diagnostics.          Group-class subjects: case study-based computations lied to the content presented in the lectures. Multimedia- and ? blackboard-aided solving of questions.          . Lab work includes activities lied to the lecture content. Work in groups, preparation of report and its evaluation.</p>	
<b>Basic bibliography:</b>	
<ol style="list-style-type: none"> <li>1. Kujaszczyk Sz. (pod red.): Elektroenergetyczne sieci rozdzielcze, tom 1 i 2, PWN, Warszawa, 2004.</li> <li>2. Kujaszczyk Sz. (pod red.): Elektroenergetyczne układy przesyłowe, WNT, Warszawa, 1997.</li> <li>3. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych. WNT, Warszawa 2013.</li> <li>4. Laudyn D., Pawlik M., Strzelczyk F.: Elekrownie, wyd. IV. WNT Warszawa. 2000.</li> <li>5. Flisowski Z., Technika wysokich napięć, WNT, Warszawa, 2005</li> <li>6. Szczepański Z., Czajewski J., Układy izolacyjne urządzeń elektro-energetycznych, WNT, 1978</li> <li>7. Jezierski E., Gogolewski Z., Koczyński Z., Szmít J. TRANSFORMATORY Budowa i projektowanie, WN-T Warszawa 1963 r.</li> </ol>	
<b>Additional bibliography:</b>	
<ol style="list-style-type: none"> <li>1. Adamska J., Niewiedział R.: Podstawy elektroenergetyki. Sieci i urządzenia elektroenergetyczne. Wyd. PP, Poznań 1989</li> <li>2. Kowalski Z., Jakość energii elektrycznej. Wyd. Politechniki Łódzkiej, Łódź, 2007.</li> <li>3. Praca zbiorowa: Napowietrzne linie elektroenergetyczne wysokiego napięcia, WN-T 1973</li> <li>4. Ograniczanie strat energii elektrycznej w elektroenergetycznych sieciach rozdzielczych, pod redakcją J. Kulczyckiego, PTPiREE, Poznań 2002.</li> <li>5. Żmuda K., Elektroenergetyczne układy przesyłowe i rozdzielcze ? Wybrane zagadnienia z przykładami. WPŚ, Gliwice 2016</li> <li>6. James H. Harlow, Electric Power Transformer Engineering, CRC Press, 2012</li> </ol>	
<b>Result of average student's workload</b>	
<b>Activity</b>	<b>Time (working hours)</b>
1. taking part to the lectures	30
2. participation in sections	15
3. participation in labs	15
4. preparation to the lab classes and elaboration of reports	23
5. preparation to the sections and examinations	20
6. discussions with lecturer	20
7. examination	2
<b>Student's workload</b>	

<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	125	5
Contact hours	82	3
Practical activities	35	1