

| <b>STUDY MODULE DESCRIPTION FORM</b>   |   |   |
|--|---|---|
| Name of the module/subject<br><b>Elective course -operation and maintenance of power distribution</b>  |   | Code<br><b>1010312331010314896</b>  |
| Field of study<br><b>Electrical Engineering</b>  | Profile of study (general academic, practical)<br><b>(brak)</b> | Year /Semester<br><b>2 / 3</b>  |
| Elective path/specialty<br><b>Power Networks and Electric Power System</b>   | Subject offered in:<br><b>Polish</b>                            | Course (compulsory, elective)<br><b>obligatory</b>  |
| Cycle of study:<br><b>Second-cycle studies</b>   | Form of study (full-time,part-time)<br><b>full-time</b>         |   |
| No. of hours<br>Lecture: <b>15</b> Classes: <b>-</b> Laboratory: <b>15</b> Project/seminars: <b>-</b>  |   | No. of credits<br><b>3</b>  |
| Status of the course in the study program (Basic, major, other)<br><b>(brak)</b>   |   | (university-wide, from another field)<br><b>(brak)</b>  |
| Education areas and fields of science and art<br><b>technical sciences</b><br><b>Technical sciences</b>  |   | ECTS distribution (number and %)<br><b>3 100%</b><br><b>3 100%</b>  |
| <b>Responsible for subject / lecturer:</b><br><br>Dr inż. Jerzy Andruszkiewicz<br>email: jerzy.andruszkiewicz@put.poznan.pl<br>tel. 61 665 2392<br>Electric Engineering<br>ul. Piotrowo 3A, 60-965 Poznań  |   |   |
| <b>Prerequisites in terms of knowledge, skills and social competencies:</b>  |   |   |
| 1  | <b>Knowledge</b>  | Student has knowledge of the fundamentals of electrical engineering, power engineering and power grid operation.                  |
| 2  | <b>Skills</b>   | Student can calculate the power flows, short-circuit currents, know the rules concernig the design of elements of the power grid. |
| 3  | <b>Social competencies</b>                                      | Student is aware of the importance of providing electricity for the development of the society.                                   |
| <b>Assumptions and objectives of the course:</b><br>Enlarging the knowledge concerning the principles of proper provision of electricity distribution and network operation services, as well as the acquisition by Students of the ability to assess phenomena interfering with reliable and qualitatively correct supply of electricity to consumers and measures to prevent such phenomena. |   |   |
| <b>Study outcomes and reference to the educational results for a field of study</b>  |   |   |
| <b>Knowledge:</b>  |   |   |
| 1. Student knows the newest achievements and development trends in the scope of chosen issues in power operation - <b>[[K_W04++]]</b>  |   |   |
| 2. Student has the knowledge about the possibilities and limitations of applied computer modelling methods used to simulate the electrical distribution network operation - <b>[[K_W04++]]</b>   |   |   |
| <b>Skills:</b>   |   |   |
| 1. Student can use apply methods and mathematical models and if necessary to modify them appropriately to analyse specific phenomena in power distribution networks - <b>[[K_U06 ++]]</b>  |   |   |
| 2. Student can evaluate the work of electricity distribution networks in terms of utility and economics, if necessary adapting the existing computing tools or developing their modification - <b>[[K_U12 ++]]</b>   |   |   |
| <b>Social competencies:</b>  |   |   |
| 1. Student knows the need and knows the way to acquire the knowledge and transfer it to the community - <b>[[K_K02++]]</b>   |   |   |
| <b>Assessment methods of study outcomes</b>  |   |   |

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|--|-----------------------------|-------------|
| <p>-the verification of knowledge acquired concerning the important factors affecting the quality of electricity distribution based on the written study prepared by Student concerning the selected major process of practical distribution of electricity,<br/>         - assessment of knowledge and skills related to the implementation of computer simulation of processes involved in distribution of electricity,<br/>         - evaluation reports concerning computer simulations conducted.</p>   |                             |             |
| <b>Course description</b>  |                             |             |
| <p>Obligations of electricity distribution network operators and electricity suppliers in the process of electricity distribution under the Energy Law and the Regulations of the Minister of Energy; the issue of security of electricity supply in terms of the adequacy of system resources and continuity of power supply from power grids; the obligations of network operators in the area of renewable energy sources network connections and services rendered to renewable energy providers in distribution networks; improving the efficiency of electricity distribution by reducing losses in distribution equipment and compensating of reactive power flow, planning the development of distribution network; distortions caused by harmonic currents and voltages and preventing measures.</p>  |                             |             |
| <b>Basic bibliography:</b>   |                             |             |
| <p>1. USTAWA z dnia 10 kwietnia 1997 r. Prawo energetyczne (Dz. U. z 2017 r. poz. 220, 791, 1089 i 1387) - tekst ujednoczony w Departamencie Prawnym i Rozstrzygania Sporów URE na dzień 2 sierpnia 2017 r.<br/>         2. ROZPORZĄDZENIE MINISTRA GOSPODARKI z dnia 4 maja 2007 r. w sprawie szczegółowych warunków funkcjonowania systemu elektroenergetycznego Dziennik Ustaw Nr 93 Poz. 623 z późniejszymi zmianami<br/>         3. ROZPORZĄDZENIE MINISTRA GOSPODARKI z dnia 18 sierpnia 2011 r. w sprawie szczegółowych zasad kształtowania i kalkulacji taryf oraz rozliczeń w obrocie energią elektryczną Dziennik Ustaw Nr 189 Poz. 1126<br/>         4. ENEA Operator Sp. z o.o. INSTRUKCJA RUCHU I EKSPLOATACJI SIECI DYSTRYBUCYJNEJ - data wejścia w życie 1 stycznia 2014 - tekst jednolity z późniejszymi zmianami<br/>         5. Enea Operator Sp. z o.o. TARYFA DLA USŁUG DYSTRYBUCJI ENERGII ELEKTRYCZNEJ obowiązująca od dnia 1 stycznia 2017 r.</p> |                             |             |
| <b>Additional bibliography:</b>  |                             |             |
| <p>1. PowerFactory - User manual Digsilent GMBH 2015<br/>         2. Kujarczyk Sz.: (red.) Elektroenergetyczne sieci rozdzielcze. Tom II, PWN Warszawa, 1994.<br/>         3. Paska Józef: Niezawodność systemów elektroenergetycznych, OWPW Warszawa 2005</p>   |                             |             |
| <b>Result of average student's workload</b>  |                             |             |
| <b>Activity</b>  | <b>Time (working hours)</b> |             |
| 1. Courses and laboratory simulations  | 30                          |             |
| <b>Student's workload</b>  |                             |             |
| <b>Source of workload</b>  | <b>hours</b>                | <b>ECTS</b> |
| Total workload   | 66                          | 3           |
| Contact hours  | 36                          | 2           |
| Practical activities   | 30                          | 1           |