



Subject card

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|---|---|--|---|-------------------------------------|--|------------|-----|
| Subject name and code | Electric Power Systems, PG_00053186 | | | | | | |
| Field of study | Electrical Engineering | | | | | | |
| Date of commencement of studies | October 2020 | | Academic year of realisation of subject | | 2022/2023 | | |
| Education level | first-cycle studies | | Subject group | | Obligatory subject group in the field of study Subject group related to scientific research in the field of study | | |
| Mode of study | Part-time studies | | Mode of delivery | | at the university | | |
| Year of study | 3 | | Language of instruction | | Polish | | |
| Semester of study | 5 | | ECTS credits | | 3.0 | | |
| Learning profile | general academic profile | | Assessment form | | assessment | | |
| Conducting unit | Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Robert Małkowski | | | | |
| | Teachers | | dr hab. inż. Robert Małkowski | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 20.0 | 0.0 | 10.0 | 0.0 | 0.0 | 30 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | | Self-study | SUM |
| | Number of study hours | 30 | | 4.0 | | 41.0 | 75 |
| Subject objectives | Student Explains regulation processes in Power grid in normal work state and after disturbance. Describes controllers used to maintain correct operation of power grid. Chooses correct operation algorithms for those controllers. Calculates chosen operation parameters of power grid with simplifying assumptions taken to consideration. | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | K6_W09 | | Students can identify selected elements of power system objects and the ways of controlling them. They can indicate the positive and negative influence they have on the environment. | | [SW1] Assessment of factual knowledge | | |
| | K6_K01 | | The student recognizes the importance of expanding individual knowledge and skills in related fields. | | [SK2] Assessment of progress of work | | |
| | K6_U06 | | The student describes the control systems used to maintain the correct operation of the power system. Selects the appropriate algorithms for the operation of these systems. Calculates selected quantities of power system operation with adopted simplifying assumptions. | | [SU3] Assessment of ability to use knowledge gained from the subject | | |

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| Subject contents | LECTURES Generator as a object to aim regulation in power system. Control systems of synchronic generators, their limitations in operation in normal and emergency states. Relations between basic electric parameters in power grid. Fluctuations of electrical frequency in power grid, its causes and effects. Frequency regulation in power grid. Protective Automatic : under-frequency load shedding systems, undervoltage load shedding systems.LABORATORY Coupling parameters of simple power grid model elements (generators, transformers, power lines) to conduct research including various load level in modeled power grid. Calculating load flow. Dependencies of voltage changed and/or transformer tap controllers moves on voltage levels and load flow in analyzed grid. | | |
| Prerequisites and co-requisites | | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | written test | 50.0% | 60.0% |
| | technical report | 50.0% | 40.0% |
| Recommended reading | Basic literature | 1. Hellmann W., Szczerba Z.: Regulacja częstotliwości i napięcia w systemie elektroenergetycznym. Warszawa: WNT 1978.2. Kożuchowski J.: Sterowanie systemów elektroenergetycznych. Warszawa: PWN 1981.3. Machowski Jan: Regulacja i stabilność systemu elektroenergetycznego, Oficyna Wydawnicza PolitechnikiWarszawskiej, 2007. | |
| | Supplementary literature | 1. Kowalik R.: Teletechnika. Podstawy dla elektroenergetyków. Wyd. Politechniki Warszawskiej 1999. 2. J. Machowski, J. Bialek, J. Bumby : "Power System Dynamics and Stability". John Wiley & Sons, Chichester, New York, 1997. | |
| | eResources addresses | Adresy na platformie eNauczanie: Systemy Elektroenergetyczne - Moodle ID: 26481 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26481 | |
| Example issues/ example questions/ tasks being completed | 1. On the graph $f = g(t)$, indicate the operation intervals of the primary and secondary control systems2. Equivalent diagram of a generator without a regulator. Equivalent diagram of a generator with an ideal regulator. In one drawing, present the characteristics for both cases.3. Replace the negative effects of the operation of power system components with too high frequency.4. Describe the influence of particular factors on the selection of the insensitivity zone of the transformer voltage regulator | | |
| Work placement | Not applicable | | |