



Subject card

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| Subject name and code | Command of Renewable Energy Sources Systems, PG_00042168 | | | | | | |
| Field of study | Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering | | | | | | |
| Date of commencement of studies | October 2020 | | Academic year of realisation of subject | | 2023/2024 | | |
| Education level | first-cycle studies | | Subject group | | Optional subject group Subject group related to scientific research in the field of study | | |
| Mode of study | Full-time studies | | Mode of delivery | | at the university | | |
| Year of study | 4 | | Language of instruction | | Polish | | |
| Semester of study | 7 | | 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. Jacek Klucznik | | | | |
| | Teachers | | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 15.0 | 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 | | 3.0 | | 42.0 | 75 |
| Subject objectives | Presentation of basic issues related to the operation of renewable energy sources in the power system. Control of active and reactive power of wind power plants and photovoltaic plants. Controlling the operation of additional sources of reactive power: reactors, capacitor banks, static compensators (SVC) and reactive power generators (Statcom). Control of energy storage systems. NC RfG grid code, classification of power generation modules, requirements for modules A, B, C and D, how to ensure and verify them. | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | K6_U04 | | The student designs and analyses a reactive power control system in a wind or photovoltaic farm and verifies its compliance with the requirements of the NC RfG regulations | | [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment | | |
| | K6_W05 | | The student knows the regulation possibilities of renewable sources in terms of active and reactive power. The student knows the requirements for renewable sources connected to the power grid. | | [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge | | |
| Subject contents | <p>Lecture:</p> <p>Active and reactive power generation by wind and photovoltaic power plants - PQ characteristics, control method, available control ranges control time.Reactive power management of a wind/photovoltaic farm. Voltage regulation. Review of documents and legal requirements for the integration of wind and photovoltaic farms into the electricity system.</p> <p>Laboratory:</p> <p>Analysis of the operation of renewable sources of the power system using the PowerFactory computing environment. Control of active and reactive power of wind and photovoltaic power plants. Control of additional sources of reactive power: reactors, capacitor banks,). Control of energy storage.</p> | | | | | | |

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| Prerequisites and co-requisites | Electric circuits theory | | |
| | Electrical machines. | | |
| | Electrical grids | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Knowledge test in the subject (lecture) | 60.0% | 30.0% |
| | Assessment of the prepared report (laboratory) | 60.0% | 70.0% |
| Recommended reading | Basic literature | Machowski J., Lubośny Z., Bialek J., Bumby J.: Power System Dynamics. Stability and Control. 3rd edition. Hoboken: John Wiley & Sons, 2020. 888 s. ISBN 9781119526346 | |
| | Supplementary literature | Selected papers - Przegląd Elektrotechniczny, IEEE Xplore | |
| | eResources addresses | Adresy na platformie eNauczanie: | |
| Example issues/ example questions/ tasks being completed | Selection of reactive power compensation equipment for a wind farm/photovoltaic farm. | | |
| | Assessment of farm response to frequency variation. | | |
| | Assessment of the farm's response to a short circuit. | | |
| Work placement | Not applicable | | |