



## Subject card

|   |  |  |   |                                     |   |            |     |
|---|--|--|---|-------------------------------------|---|------------|-----|
| Subject name and code                       | Modelling and Simulation of Electromechatronic Systems, PG_00048273  |  |   |                                     |   |            |     |
| Field of study                              | Electrical Engineering   |  |   |                                     |   |            |     |
| Date of commencement of studies             | October 2021   |  | Academic year of realisation of subject   |                                     | 2023/2024   |            |     |
| Education level                             | first-cycle studies  |  | Subject group   |                                     |   |            |     |
| Mode of study                               | Full-time studies  |  | Mode of delivery  |                                     | at the university   |            |     |
| Year of study                               | 3  |  | Language of instruction   |                                     | Polish  |            |     |
| Semester of study                           | 5  |  | ECTS credits  |                                     | 6.0   |            |     |
| Learning profile                            | general academic profile   |  | Assessment form   |                                     | assessment  |            |     |
| Conducting unit                             | Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering   |  |   |                                     |   |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor   |  | prof. dr hab. inż. Piotr Chrzan   |                                     |   |            |     |
|   | Teachers   |  |   |                                     |   |            |     |
| Lesson types and methods of instruction     | Lesson type  | Lecture  | Tutorial  | Laboratory                          | Project   | Seminar    | SUM |
|   | Number of study hours  | 30.0   | 0.0   | 30.0                                | 0.0   | 0.0        | 60  |
|   | 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  | 60   |   | 5.0                                 |   | 85.0       | 150 |
| Subject objectives                          | Get basic knowledge and skill on circuit oriented modelling and simulation of power electronic systems   |  |   |                                     |   |            |     |
| Learning outcomes                           | Course outcome   |  | Subject outcome   |                                     | Method of verification  |            |     |
|   | K6_K01   |  | Student extends skills on team working and presentation of project results.   |                                     | [SK1] Assessment of group work skills<br>[SK4] Assessment of communication skills, including language correctness |            |     |
|   | K6_K05   |  | does not include for this course  |                                     | [SK1] Assessment of group work skills   |            |     |
| Subject contents                            | 1) Classification of modeling levels: component, behavioral, functional. Methods of numerical computation of dynamic systems. 2) Simulation methodology of power electronic converters. Survey of general purpose simulation software: LTspice, Matlab-Simulink, Saber-Mast. 3) TCad 8: circuit oriented power electronic simulation software. 4) Specifying parameters of elements in TCad: resistor, capacitor, inductor, transformer, power electronic switches. Models of electrical machines, mechanical loads and controllers. 5) Functional models. 6-7) Control modules in user-defined units. |  |   |                                     |   |            |     |
| Prerequisites and co-requisites             | Basic knowledge on power electronics and electrical drives.  |  |   |                                     |   |            |     |
| Assessment methods and criteria             | Subject passing criteria   |  | Passing threshold   |                                     | Percentage of the final grade   |            |     |
|   | lecture  |  | 50.0%   |                                     | 50.0%   |            |     |
|   | project  |  | 50.0%   |                                     | 50.0%   |            |     |
| Recommended reading                         | Basic literature   |  | 1. R. Szczesny, Komputerowa symulacja układów energo-elektronicznych, Wydawnictwo Politechniki Gdańskiej 1999.<br><br>2. M. Wilamowski, J.David Irwin (ed.) The industrial Electronics Handbook: Power electronics and motor drives, CRC Taylor & Francis Group 2nd edition 2011<br><br>3. K. Zawirski, J. Deskur, T. Kaczmarek, Automatyka napędu elektrycznego. Wydaw. Politechniki Poznańskiej 2012. |                                     |   |            |     |

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|  | Supplementary literature   | <p>1. J. Nieznański, K. Iwan, R. Szczęsny, M. Ronkowski, TCad for Windows, Softech 1996</p> <p>2. A.-R. Haithem, A. Iqbal, J. Guziński, High performance control of ac drives with Matlab/Simulink, John Wiley &amp; Sons 2021</p> |
|  | eResources addresses   | Adresy na platformie eNauczanie:   |
| Example issues/<br>example questions/<br>tasks being completed | Explain differences between behavioral and functional modeling on the example of pulse width modulation voltage source inverter. |  |
| Work placement   | Not applicable   |  |