Załącznik nr 2 do Zarządzenia Nr 915 z 2019 r. Rektora PB

**COURSE DESCRIPTION CARD – SPECIMEN**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Faculty of Electrical Engineering** | | | | | | | | | | |
| **Field of study** | **Electrical and Electronics Engineering** | | | | | | | **Degree level and programme type** | **Bachelor's degree,** | |
| **Specialization/ diploma path** |  | | | | | | | **Study profile** |  | |
| **Course name** | **Control of Electrical Drives 1** | | | | | | | **Course code** | **IS-FEE-10069W** | |
| **Course type** | **elective** | |
| **Forms and number of hours of tuition** | **L** | **C** | **LC** | **P** | **SW** | **FW** | **S** | **Semester** | **winter** | |
| **15** | **-** | **15** | **30** | **-** | **-** | **-** | **No. of ECTS credits** | **6** | |
| **Entry requirements** |  | | | | | | | | | |
| **Course objectives** | The introduction into the construction and the features analysis methods of the electrical drives for energy conversion and for torque, speed and position control. | | | | | | | | | |
| **Course content** | **Lecture:** Control characteristic of motor and power converter. Torque - speed characteristics of electrical motors, generators and the automatically controlled drives. Multi-quadrant operation of the converter controlled DC and AC drives. Power flow and energy losses in electric drives. Structure and synthesis of simple drive system subsystems. Quality control assessment.  **Laboratory classes:** Investigation into speed control system with DC servomotor motor drive, investigation into steady state and transient features. Investigation into position measurement system with resolver in the sine – cosine operating mode. Investigation into position measurement system with resolver in the phase shifter operating mode. Investigation into control characteristic of variable speed control system with induction motor, DC/AC converter and frequency adjustment.  **Project:** The student designs and simulates in Matlab the automatically controlled electric servodrive. | | | | | | | | | |
| **Teaching methods** | lecture, laboratory experiments, demonstration, problem-based learning, small group teaching, work on a project | | | | | | | | | |
| **Assessment method** | lecture – oral test, laboratory classes – evaluation of reports, project – evaluation of project | | | | | | | | | |
| **Symbol of learning outcome** | **Learning outcomes** | | | | | | | | **Reference to the learning outcomes for the field of study** | |
|  | **Knowledge: the graduate knows and understands** | | | | | | | |  | |
| **LO1** | basic functional blocks in structure of electric drive system | | | | | | | |  | |
|  | **Skills: the graduate is able to** | | | | | | | |  | |
| **LO2** | analyze power flow and energy losses in a simple drive system | | | | | | | |  | |
| **LO3** | determine the basic properties of electric drive | | | | | | | |  | |
| **LO4** | design and simulates of simple electric drive | | | | | | | |  | |
| **LO5** |  | | | | | | | |  | |
| **LO6** |  | | | | | | | |  | |
| **Symbol of learning outcome** | **Methods of assessing the learning outcomes** | | | | | | | | **Type of tuition during which the outcome is assessed** | |
| **LO1** | tests on lecture content | | | | | | | | L | |
| **LO2** | assessment of the drive operation, evaluating of the student's reports and performance in classes | | | | | | | | LC | |
| **LO3** | assessment of the drive operation, evaluating the student's reports and performance in classes | | | | | | | | LC | |
| **LO4** | evaluating the student's project | | | | | | | | P | |
| **LO5** |  | | | | | | | |  | |
| **LO6** |  | | | | | | | |  | |
| **Student workload (in hours)** | | | | | | | | | **No. of hours** | |
| **Calculation** | lecture attendance | | | | | | | | 15h | |
| participation in laboratory classes | | | | | | | | 15h | |
| participation in project | | | | | | | | 30h | |
| participation in student-teacher sessions | | | | | | | | 5 | |
| preparation for laboratory classes, project | | | | | | | | 30h | |
| working on laboratory reports, | | | | | | | | 20h | |
| working on project | | | | | | | | 20h | |
| preparation for exam | | | | | | | | 10h | |
| **TOTAL:** | | | | | | | | 150h | |
| **Quantitative indicators** | | | | | | | | | **HOURS** | **No. of ECTS credits** |
| **Student workload – activities that require direct teacher participation** | | | | | | | | | 65h | 3 |
| **Student workload – practical activities** | | | | | | | | | 110h | 4,4 |
| **Basic references** | 1. Weidauer Jens: "Electrical drives: principles, planning, applications, solutions", Erlangen: Publicis Publishing, 2014.  2. Mohan N.: "Advanced electric drives: analysis, control and modelling using MATLAB/Simulink", Hoboken: John Willey and sons, 2014.  3. Seung-Ki Sul: "Control of Electric Machine Drive Systems”, IEEE Press, A John Willey and sons, INC, Publication, USA, 2011.  4. Weidauer J. “Electrical drives : principles, planning, applications, solutions.” Erlangen: Publicis Publishing, 2014.  5. Wilamowski B. M., Irwin J.D. "Control and Mechatronics”, Taylor and Francis, USA, 2011. | | | | | | | | | |
| **Supplementary references** | 1. Seung-Ki Sul: „Control of Electric Machine Drive Systems”, IEEE Press, A John Willey and sons, INC, Publication, USA, 2011.  2. Leonard W. "Control of Elektric Drives", 3rd Edition, Springer-Verlag, Berlin, 2001.  3. .Alahakoon Sanath: "Digital Control Techniques for Sensorless Electrical Drives”, VDM Verlar Dr Muller, Germany, 2009.  4. Wilamowski B. M., Irwin J.D. “Control and Mechatronics”, Taylor $ Francis, USA, 2011.  5. Chang Y. “Crucial problems of powertrain control in electric vehicles and hybrid electric vehicles”, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2019. | | | | | | | | | |
| **Organisational unit conducting the course** | DEPARTMENT OF ELECTROTECHNICS, POWER ELECTRONICS AND POWER ENGINEERING | | | | | | | | **Date of issuing the programme** | |
| **Author of the programme** | Andrzej Andrzejewski, PhD Eng. | | | | | | | | 02.02.2023 | |

**L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,**

**S – seminar**