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

**COURSE DESCRIPTION CARD**

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| **Faculty of Electrical Engineering** |
| **Field of study** | **Electrical and Electronics Engineering** | **Degree level and programme type** | **bachelor's degree, full time programme** |
| **Specialization/ diploma path** | **-** | **Study profile** | **-** |
| **Course name** | **Fundamentals of Control Engineering** | **Course code** | **IS-FEE-10008W** |
| **Course type** | **elective** |
| **Forms and number of hours of tuition**  | **L** | **C** | **LC** | **P** | **SW** | **FW** | **S** | **Semester** | **winter** |
| **30** |  | **30** |  |  |  |  | **No. of ECTS credits** | **6** |
| **Entry requirements** | **mathematics, physics.** |
| **Course objectives** | **Introducing students to structures, tasks and methods of analysis and synthesis of simple control systems. Application of different methods of controllers design for control of simple processes** |
| **Course content** | **Lecture: Laplace transforms of commonly encountered time function and basic Laplace transforms. Mathematical modelling of dynamic systems. Transient-response analysis of first and second-order systems. The correlation between transient and frequency-response and s-plane diagram. Stability of linear time-invariant systems. Hurwitz and Nyquist asymptotic stability criteria. Quality parameters of control on the basis of time and frequency domain performance specifications. Process control and the tuning of three-term controllers (analytical and experimental methods). Discrete time and computer control systems. Analytical techniques required for discrete time system analysis. Design methods for discrete time controllers. Nonlinear systems - practical aspects including relaycontrolled systems (PD and PID compensation). Laboratory class: Basic methods of identification, modelling and control of simple plants. Industry PID controllers, configuration and tuning methods. Control of nonlinear systems (with relay).** |
| **Teaching methods** | **lecture, laboratory class** |
| **Assessment method** | **written exam (lecture), evaluation of homework reports (laboratory class)** |
| **Symbol of learning outcome**  | **Learning outcomes** | **Reference to the learning outcomes for the field of study** |
| **LO1** | **has an elementary knowledge of analysis and synthesis methods of simple automatic control system and its constituent parts;** |  |
| **LO2** | **is capable of evaluating the quality specifications of control system and has an elementary knowledge of basic compensation methods of control system;** |  |
| **LO3** | **can describe procedures necessary for setting the parameters of three term controllers** |  |
| **LO4** | **has some skills of identification and control of simple plants** |  |
| **Symbol of learning outcome** | **Methods of assessing the learning outcomes** | **Type of tuition during which the outcome is assessed** |
| **LO1** | **written exam, evaluation of reports** | **L,LC** |
| **LO2** | **written exam, evaluation of reports** | **L,LC** |
| **LO3** | **written exam, evaluation of reports** | **L,LC** |
| **LO4** | **evaluation of reports** | **LC** |
| **Student workload (in hours)** | **No. of hours** |
| **Calculation** | **lecture attendance** | **30** |
| **individual work on lecture topics** | **30** |
| **preparation for and participation in exams/tests** | **15** |
| **laboratory class attendance** | **30** |
| **preparation for laboratory class** | **15** |
| **work on reports** | **30** |
| **TOTAL:** | **150** |
| **Quantitative indicators** | **HOURS** | **No. of ECTS credits** |
| **Student workload – activities that require direct teacher participation** | **60** | **2** |
| **Student workload – practical activities** | **120** | **4** |
| **Basic references** | **1. Ogata K.: Modern control engineering. Prentice-Hall International, 2004.** **2. Nise N.S.: Control Systems Engineering, 5th edition, Wiley, 2008.** **3. Åström K.J, Murray R.M.: Feedback Systems: An Introduction for Scientists and Engineers, Princeton University Press, 2008.** **4. Norman N. S.: Control systems engineering,** **5th ed., John Wiley a. Sons, Hoboken 2008.** |
| **Supplementary references** | **1. Kaczorek T.: Linear Control Systems, vol. 1 and 2, Research Studies Press, 1993.** **2. Presentations for lecture (on-line available).** |
| **Organisational unit conducting the course** | **Department of Automatic Control and Electronics** | **Date of issuing the programme** |
| **Author of the programme** | **prof. Tadeusz KACZOREK, PhD Eng, Łukasz Sajewski, PhD Eng. Krzysztof Rogowski, PhD Eng.** | **08.02.2020** |

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

**S – seminar**