**COURSE DESCRIPTION CARD – SPECIMEN**

<table>
<tr><td colspan="10">Faculty of Electrical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Automatic Control and Robotics</td><td>Degree level and programme type</td><td>Bachelor's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">-</td><td>Study profile</td><td>-</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Computer Methods in Automatics</td><td>Course code</td><td>IS-FEE-10065S</td></tr>
<tr><td>Course type</td><td>elective</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>summer</td></tr>
<tr><td>30</td><td></td><td></td><td>30</td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>6</td></tr>
<tr><td>Entry requirements</td><td colspan="9">-</td></tr>
<tr><td>Course objectives</td><td colspan="9">This course deals with the study of engineering principles and methodologies used main computer programs to solve fundamental problems in control plants and control systems. Major course topics include knowledge of Matlab/Simulink software used to computing, modelling, analysing and plotting of dynamical systems and linear control systems. Before attendance of this course, students should have basic knowledge of computer programming and description of control plants.</td></tr>
<tr><td>Course content</td><td colspan="9">Descriptions of the main computer programs used in automatics. Introduction and fundamentals of Matlab. System functions and configuration of Matlab environment. Matrix and operations. Numerical computations. M-files and function scripts. Graphics, plotting and visualization in 2D and 3D. Modelling of dynamical systems with Control Toolbox. Design of complex dynamical systems by using Control Toolbox. Analysing dynamical systems in time and frequency domains in Matlab. Design linear control systems in Matlab. Introduction and fundamentals of Simulink. Setup and simulation parameters in Simulink. Modelling and simulations of dynamical systems in Simulink. Design and analysing of the complex control systems in Simulink. Group subsystems and map blocks in Simulink. Modelling and investigations of dynamical systems in Matlab Control Toolbox. Design and simulations of dynamical systems in Simulink. Design of linear control system with structurally unstable control plant in Matlab/Simulink. PID and LQR control design. Descriptions of the main computer programs used in automatics. Introduction and fundamentals of Matlab. System functions and configuration of Matlab environment. Matrix and operations. Numerical computations. M-files and function scripts. Graphics, plotting and visualization in 2D and 3D. Modelling of dynamical systems with Control Toolbox. Design of complex dynamical systems by using Control Toolbox. Analysing dynamical systems in time and frequency domains in Matlab. Design linear control systems in Matlab. Introduction and fundamentals of Simulink. Setup and simulation parameters in Simulink. Modelling and simulations of dynamical systems in Simulink. Design and analysing of the complex control systems in Simulink. Group subsystems and map blocks in Simulink. Modelling and investigations of dynamical systems in Matlab Control Toolbox. Design and simulations of dynamical systems in</td></tr>
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|---|---|---|
| | Simulink. Design of linear control system with structurally unstable control plant in Matlab/Simulink. PID and LQR control design. | |
| **Teaching methods** | power-point presentations, Matlab/Simulink software, Matlab/Simulink Toolboxes, project examples, MathWorks help, text books, other documents given by the teacher | |
| **Assessment method** | lecture – written exam, project – project completion, presentation and discussion, performance of the project | |
| **Symbol of learning outcome** | **Learning outcomes** | **Reference to the learning outcomes for the field of study** |
| **LO1** | knowledge and solving of differential equations with using Matlab/Simulink | |
| **LO2** | modelling and solving of linear dynamic systems with Matlab/Simulink | |
| **LO3** | knowledge of methods of designing control plants in the Matlab/Simulink program | |
| **LO4** | practical skills needed to develop and calculate the modelling and control design problems with support of Matlab/Simulink | |
| **LO5** | skills and knowledge acquired to a practical, hands-on project, linear control design methods with Matlab/Simulink | |
| **LO6** | demand for cooperation with other student within group, as well as an increased awareness of its vital importance for development | |
| **Symbol of learning outcome** | **Methods of assessing the learning outcomes** | **Type of tuition during which the outcome is assessed** |
| **LO1** | written exam, project evaluation, activity on project classes | **L, P** |
| **LO2** | written exam, project evaluation, activity on project classes | **L, P** |
| **LO3** | written exam, project evaluation, activity on project classes | **L, P** |
| **LO4** | written exam, project evaluation, activity on project classes | **L, P** |
| **LO5** | written exam, project evaluation, activity on project classes | **L, P** |
| **LO6** | student activity on project classes | **P** |
| **Student workload (in hours)** | | **No. of hours** |
| **Calculation** | lecture attendance | **30** |
| | participation in classes, laboratory classes, etc. | **30** |
| | preparation for classes, laboratory classes, projects, seminars, etc. | **42** |
| | working on projects, reports, etc. | **12** |
| | participation in student-teacher sessions related to the classes/seminar/project | **4** |
| | implementation of project tasks and preparation for and participation in exams/tests | **48** |
| | **TOTAL:** | **166** |
| **Quantitative indicators** | | **HOURS** / **No. of ECTS credits** |
| **Student workload – activities that require direct teacher participation** | | **66** / **2.5** |
| **Student workload – practical activities** | | **110** / **4** |

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| **Basic references** | 1. Tewari A., Modern Control Design: with Matlab and Simulink, Wiley-IEEE Press, 2001.<br>2. Ogata K., Modern Control Engineering, 4th ed., Pearson Education International, 2002.<br>3. Hahn B., Valentine D. T., Essential Matlab for Engineers and Scientists, 3rd ed., Elsevier Science & Technology Books, 2007. | |
| **Supplementary references** | 1. Bequette B.W., Process Control, Modeling, Design and Simulation, Prentice Hall, 2003.<br>2. Dorf R.C., Bishop R.H., Modern Control Systems, 10th Edition, Prentice Hall, 2005.<br>3. The MathWorks, Control System ToolboxTM User's Guide, 8th ed., 2009.<br>4. www.mathworks.com. | |
| **Organisational unit conducting the course** | **Department of Automatic Control and Electronics** | **Date of issuing the programme** |
| **Author of the programme** | **Assoc Prof. Arkadiusz Mystkowski, PhD, DSc, Eng** | **25.03.2020** |

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