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 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">Process Automation</td><td>Course code</td><td>IS-FEE-10063S</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 to design and analysis of event driven (discrete) and continuous systems. Emphasis is placed on description methods and software implementation of combination and sequential systems. A structured approach to automation of selected systems, identifies appropriate equipment, production and manufacturing techniques.</td></tr>
<tr><td>Course content</td><td colspan="9">Automation of event driven systems (discrete) and continuous systems. Finite state machines theory. Melay and Moore machines. Description methods of combination, synchronous and asynchronous sequential systems and their elements. Types and conversion, codes. Diagram; state reduction; state assignment. Grafcet, SFC, Grafpol and Ladder diagram design sequence. PLC-based operative unit programming. Sequential logic implementation. Analysis by signal tracing and timing diagrams. Matlab Stateflow functions. Derivation of state tables and diagrams. True tables. Steps, transitions, connectors, direct links, logical conditions.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">power-point presentations, Matlab/Simulink software, Matlab/Simulink, Stateflow toolbox, project examples, MathWorks help, text books</td></tr>
<tr><td>Assessment method</td><td colspan="9">lecture – written exam, project – project completion, presentation and discussion, performance of the project</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="7">basic knowledge of sequential and combinational circuits, programming methods, and designing of industrial automation process</td><td colspan="2"></td></tr>
<tr><td>LO2</td><td colspan="7">knowledge of even driven (digital) and continuous control systems hardware, principle of finite state machines, and background of automation systems</td><td colspan="2"></td></tr>
<tr><td>LO3</td><td colspan="7">knowledge of define of automation systems, ability to search, integrate and interpret information from literature and alternative sources</td><td colspan="2"></td></tr>
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LO4	practical skills to design of continuous and discrete control systems including their functionality and economic benefit, control systems' hardware selection ability and the self-tuning of controllers' parameters	
LO5	ability and skills to event driven control system design, and to formulate assumptions/conditions for the basic automation batch process	
LO6	demand for permanent education 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	**L**
LO2	written exam	**L**
LO3	written exam	**L**
LO4	written exam, project evaluation, activity on project classes	**L, P**
LO5	written exam, project evaluation, activity on project classes	**L, P**
LO6	written exam, project evaluation, activity on project classes	**L, 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,	**25**
	working on projects, reports, etc.	**45**
	participation in student-teacher sessions related to the classes/seminar/project	**5**
	implementation of project tasks and preparation for and participation in exams/tests	**22**
	TOTAL:	**157**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**68**	**2,5**
Student workload – practical activities	**116**	**4**

Basic references	1. Charles H.Roth, Fundamentals Logic Design, Jaico Publishing, IV edition, 2002. 2. Thomas L. Floyd, Digital Fundamentals, 10th edition, Pearson Education, 2009. 3. Hugh J., Automating Manufacturing Systems with PLCs, E-book, Ver. 5.0, 2007. 4. M. Morris Mano Michael D Ciletti, Digital Design, Pearson Education, 5th edition 2012. 5. The MathWorks, Stateflow Toolbox for Matlab.
Supplementary references	1. Bequette B.W., Process Control, Modeling, Design and Simulation, Prentice Hall, 2003. 2. Dorf R.C., Bishop R.H., Modern Control Systems, 10th Edition, Prentice Hall, 2005. 3. 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