COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Mechanical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Mechatronics</td><td>Degree level and programme type</td><td>full-time studies 1st degree, Eng.</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">Measuring and control signals</td><td>Course code</td><td>IS-FME-00212S</td></tr>
<tr><td>Course type</td><td>obligatory</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>0</td><td>15</td><td>0</td><td>0</td><td>0</td><td>0</td><td>No. of ECTS credits</td><td>4</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Maths, introduction to computer science, informatics</td></tr>
<tr><td>Course objectives</td><td colspan="9">Familiarizing students with the types of measurement and control signals. Presentation of methods and ways of filtration of considered signals. Scaling of signals and their generation and acquisition.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: Basic measurement signals and measurement sensors. Characteristics of the measuring signal. Filtration methods and analysis of measurement errors. Types of control signals and division of devices for their generation. Analysis of measurement data and their representation. Signals in automatic control systems. Types and principles of operation of communication interfaces. Application and representation of radio, audio and video signals.
Laboratories: Measurement, acquisition and representation of real discrete and analog signals. Selection of measurement methodology and construction of filters for measurement signals. Building dedicated applications for the acquisition, processing and representation of measurement signals.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Lecture for information and problem solution. Laboratory classes.</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture: two tests.
Laboratory classes: tests, marks for reports, marks for activity.</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">The student lists and classifies measurement signals</td><td colspan="2">MK1_W04</td></tr>
<tr><td>LO2</td><td colspan="7">The student lists and classifies control signals</td><td colspan="2">MK1_W04</td></tr>
<tr><td>LO3</td><td colspan="7">The student is able to characterize measurement and control signals</td><td colspan="2">MK1_W04</td></tr>
<tr><td>LO4</td><td colspan="7">The student has knowledge about the methods of measurement of basic physical quantities</td><td colspan="2">MK1_W04, MK1_W08</td></tr>
<tr><td>LO5</td><td colspan="7">The student knows the means and can use computation for signal processing both in time domain and frequency domain</td><td colspan="2">MK1_W04</td></tr>
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LO6	The student is able to choose devices for measurement and control in mechatronics	MK1_U10
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: two tests	L
LO2	Lecture: two tests	L
LO3	Lecture: two tests	L
LO4	Lecture: two tests	L
LO5	Laboratory classes: tests, marks for reports, marks for activity.	LC
LO6	Laboratory classes: tests, marks for reports, marks for activity.	LC

Student workload (in hours)		No. of hours
Calculation	Participation in lectures	30
	Participation in laboratory classes	15
	Time to prepare for the lecture tests	36
	Background to laboratory	30
	Time to perform laboratory reports	15
	Participation in tutorship	2
	TOTAL:	128

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	47	1.9
Student workload – practical activities	45	1.8

Basic references	1. Roberts M.J.: Fundamentals of signals and systems. Boston: McGraw-Hill, 2008. 2. Szewczyk R., Zieliński C., Kaliczyńska M.: Progress in automation, robotics and measuring techniques : control and automation / eds. Cham: Springer, 2015. 3. Awrejcewicz J., Kaliński K.J., Szewczyk R., Kaliczyńska M.: Mechatronics: ideas, challenges, solutions and applications / eds. Cham: Springer, 2016. 4. Control and mechatronics / ed. by Bogdan M. Wilamowski, J. David Irwin. Boca Raton: CRC/Taylor & Francis, 2011.
Supplementary references	1. Pawlak A.M.: Sensors and actuators in mechatronics : design and applications / Boca Raton: CRC/Taylor & Francis, 2007. 2. Measurement, instrumentation, and sensors handbook : spatial, mechanical, thermal, and radiation measurement / ed. by John G. Webster, Halit Eren. Boca Raton: CRC/Taylor & Francis, 2014. 3. Sensors, systems and solution for displacement and temperature measurement: measurement product guide 2009. Ortenburg : MICRO-EPSILON, 2009.

Organisational unit conducting the course	Department of Robotics and Mechatronics	Date of issuing the programme
Author of the programme	Mariusz Bogdan, PhD Eng.	21.02.2021

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