Subject programme

1. Subject name / subject module: **Data Aquisition with Matlab**
2. Lecture language: **English**
3. The location of the subject in study plans:
   - Area or areas of the studies: **Computer Control Systems Engineering**
   - Degree of the studies: **2nd degree studies**
   - Field or fields (implementation of effects standard): **Mechatronics**
4. Supervision of subject implementation:
   - The Institute / Another unit: **Institute of Informatics and Mechatronics**
   - The person responsible for the subject: **Kowalczyk Marta, dr**
   - People cooperating in the development of the programme of the subject:
5. The number of hours and forms of teaching for individual study system and the evaluation method:

Teaching activities with the tutor													
Mode of study	Form of classes												Total
	Lecture	SOW	ECTS	Laboratory work	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	ECTS
Full-time studies	15	35	2	22	28	2							**4**
Part-time studies													
Credit rigor	Exam			Graded assigment									

6. Student workload – ECTS credits balance:
   1 ECTS credit corresponds to 25-30 hours of student work needed to achieve the expected learning outcomes including the student's own work

Activity (please specify relevant work for the subject)	**Hourly student workload (full-time studies/ part-time studies)**
Participation in lectures	15
Participation in laboratory classes	22
Preparation to laboratory classes	28
Independent study of the subject	20
Preparation to an exam	13
Participation in an exam	2
Total student workload (TSW)	100
ECTS credits	4
* Student's workload related to practical forms	50
Student's workload in classes requiring direct participation of academic teachers	37

7. Implementation notes: recommended duration (semesters), recommended admission requirements, relations between the forms of classes:
   - Recommended admission requirements – none.
   - Recommended duration of the subject is taken from the course plan.
8. Specific learning outcomes – knowledge, skills and social competence:

Specific learning outcomes for the subject		Form	Teaching method	Methods for testing of (checking, assessing) learning outcomes
Outcome symbol	Outcome description			
Knowledge				
K_W07	**A student possesses sufficient knowledge in the field of technical informatics, necessary to understand data acquisition rules and to apply this knowledge in practice through the use of appropriate algorithms, converters, codecs, and software to properly represent and process analog signals.**	**Lecture**	**Expository methods**	**Exam**
Skills				
K_U02	**A student is able to use information and communication technologies (ICT) to present measurement results and use analytics platform to aggregate, visualize, and analyze data streams in the cloud.**	**Laboratory work**	**Inquiry methods**	**Exam**

K_U03	**The student has sufficient skills to plan and carry out experiments, including data acquisition with Matlab, interpret and present the obtained measurement results and draw conclusions.**			

9. Assessment rules / criteria for each form of education and individual grades:

a. exam

0% - 60%	ndst	**81% - 90%**	db
61% - 70%	dst	**91% - 93%**	db+
71% - 80%	dst+	**94% - 100%**	bdb

10. The learning contents with the form of the class activities on which they are carried out:

a. Using MATLAB to make plots: subplots, script and function files, matrix operations, acquisition of data from multimeter, acquisition fo data from oscilloscope. (lecture, laboratory classes)

b. Signals: elementary signals, the Laplace transform, using Matlab for finding the Laplace transforms of time functions, the inverse Laplace transform, convolution, properties and theorems of the Fourier Transform, using MATLAB for finding the Fourier Transform of time functions, the Discrete Fourier Transform (DFT), the Fast Fourier Transform (FFT). (lecture, laboratory classes)

c. Ardunio to Matlab: communication using serial port functions, Matlab Support Package for Arduino, Simulink Support Package for Adruino. (laboratory classes)

d. Raspberry Pi to Matlab: Raspberry Pi support from Matlab, Raspberry Pi support from Simulink, Raspberry Pi support from Matlab Coder, use the Raspberry Pi camera board to capture images and video, optical characeter recognition, pattern matching. (laboratory classes)

e. Data collection in the cloud: ThingSpeak platform, JSON data format, REST API, energy monitoring example, air quality example. (lecture, laboratory classes)

11. Required teaching aids:

a. Lecture - multimedia projector.

b. Laboratory classes - specialist laboratory.

12. Literature:

a. Basic literature:

1. Chapman S.; MATLAB Programming with Applications for Engineers; ISBN 978-0-495-66807-7; Cengage Learning 2013

2. Marcel J.M. Pelgrom; Analog-to-Digital Conversion; ISNB 978-1-4614-1371-4; Springer 2017

b. Supplementary literature:

1. Orhan Gazi; Understanding Digital Signal Processing; ISBN 978-981-10-4962-0; Springer 2018

2. Ogata Katsuhiko; Matlab for control engineers; ISBN 978-0-13-615077-0; Pearson Prentice Hall 2008

3. Krzysztof Sozański; Digital Signal Processing in Power Electronics Control Circuits; ISBN 978-1-4471-7332-8; Springer 2017

c. Internet sources:

1. Scilab tutorial - www.scilab.org/tutorials

2. Matlab tutorial - www.mathworks.com/support/learn-with-matlab-tutorials.html

3. TI Principles of Data Acquisition and Conversion - https://www.ti.com/lit/an/sbaa051a/sbaa051a.pdf

4. Arduino Support from MATLAB - https://www.mathworks.com/hardware-support/arduino-matlab.html

5. MATLAB Support Package for Raspberry Pi Hardware - www.mathworks.com/help/supportpkg /raspberrypiio

6. ThingSpeak for IoT Projects - https://thingspeak.com/

13. Available educational materials divided into forms of class activities (Author's compilation of didactic materials, e-learning materials, etc.).

14. Teachers implementing particular forms of education:

Form of education	Name and surname
1. Lecture	Kowalczyk Marta, dr
2. Laboratory classes	Kowalczyk Marta, dr
3. Training	
4. Project classes	
5. Workshop classes	
6. Simulation game	
7. Language classes	