Subject programme

1. Subject name / subject module: **Computer Measurements Systems**
2. Lecture language: **English**
3. The location of the subject in study plans:
   - Area or areas of the studies: **Computer Engineering and Mechatronics**
   - Degree of the studies: **1st degree studies**
   - Ftield 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: **Grad Piotr, dr inż.**
   - 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
		SOW	ECTS	Laboratory work	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	ECTS
Full-time studies				16	22	1,5																1,5
Part-time studies																						
Credit rigor				Graded assignment																		

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	-
Participation in laboratory classes	16
Preparation to laboratory classes	12
Independent study of the subject	20
Participation in an exam / graded assignment	-
Total student workload (TSW)	38
ECTS credits	1,5
* Student's workload related to trainings	38
Student's workload in classes requiring direct participation of academic teachers	16

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_W01	**A student possesses sufficient knowledge of automated measurement systems and how to use them to solve tasks related to mechatronics.**	**Laboratory work**	**Inquiry methods**	**Student learning activities**
Skills				
K_U08	**A student has sufficient skills to design, prototype, and implement an automated measurement system and is able to use IT tools to collect data, extract information from data, interpret the results, and draw conclusions.**	**Laboratory work**	**Inquiry methods**	**Student learning activities**

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

0% - 50%	ndst	**80% - 86%**	db
51% - 70%	dst	**87% - 93%**	db+
71% - 79%	dst+	**94% - 100%**	bdb

Activity	Grades	Calculation	To Final
Tasks done during laboratory classes	dst, db, bdb, db (3,4,5,4)	arithmetic mean (3,4,5,4) * 90%	3,6
Attendance	on 70% of all classes	70% * 5 -> 3,5 * 10%	0,35
Final result			3,95
Grade		3,95/5 = 79%	**db (4.0)**

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

(Laboratory work)

1. Introduction to computer measurement systems;

2. Wired and wireless measuring systems;

3. Hardware platforms for computer measurement systems;

4. Arduino platform examples and features. Wired and wireless data transmissions;

5. Computer measurement system design based on Arduino Ethernet and Arduino WIFI platforms;

6. Raspberry Pi platforms – models comparison, peripherals, characteristics, features, software, operating systems;

7. Computer measurement system design based on Raspberry Pi platform;

8. PLC platforms – Siemens LOGO controller family – models comparison, peripherals, characteristics, features, software;

9. Computer measurement system design based on LOGO!8 platform;

10. LabVIEW software and hardware;

11. Computer measurement system design based on LabVIEW software and hardware;

12. Selected measurements of physical quantities with the help of electronic devices - light meters (photoresistor, photodiode, phototransistor), sound/noise meters, temperature meters, air quality meters, distance meters, pressure meters and others;

13. Introduction to IoT technology;

Industry 4.0.

11. Required teaching aids:

a. Lecture - multimedia projector

b. Laboratory classes - specialist laboratory

12. Literature:

a. Basic literature:

1. Gabriele D'Antona, Alessandro Ferrero; Digital Signal Processing for Measurement Systems; ISBN 978-0-387-28666-2; Springer 2006

b. Supplementary literature:

1. Johnson Gary W., Jennings Richard; LabVIEW graphical programming; ISBN 0-07-145146-3; McGraw-Hill 2006

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

3. Marcel J.M. Pelgrom; Analog-to-Digital Conversion; I

c. Internet sources:

1. National Instruments Product Documentation - www.ni.com/pl-pl/support/documentation.html

2. National Instruments Knowledge Base - search.ni.com/nisearch/app/main/p/ap/tech/lang/pl/pg/1/sn/catnav:kb/

3. How to program Arduino with Labview - microcontrollerslab.com/program-arduino-labview-example/

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	
2. Laboratory classes	Grad Piotr, dr inż.
3. Training	
4. Project classes	
5. Workshop classes	
6. Simulation game	
7. Language classes	