Subject programme

1. Subject name / subject module: **Signal Processing**
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**
   - 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: **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				32	43	3																3
Part-time studies																						
Credit rigor				Exam																		

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	32
Preparation to laboratory classes	20
Independent study of the subject	5
Preparation to an exam test	16
Participation in an exam / graded assignment	2
Total student workload (TSW)	75
ECTS credits	3
* Student's workload related to trainings	75
Student's workload in classes requiring direct participation of academic teachers	32

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_W05	**A student possesses sufficient knowledge of electronics, necessary to understand the processing of signals, and is able to apply this knowledge in practice through the selection of a suitable signal processing techniques for an application.**	**Laboratory work**	**Inquiry methods**	**Exam Student learning activities**
K_W08	**A student possesses adequate theoretical and practical knowledge on signal parameters, signal processing algorithms, and about the role of those algorithms in control systems.**			
Skills				
K_U08	**A student has sufficient skills to work with analog signals in measurement systems and to use computer software as a tool to simulate analog signal processing.**	**Laboratory work**	**Inquiry methods**	**Exam 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
Lab reports	dst, db, bdb, db (3,4,5,4)	arithmetic mean (3,4,5,4) * 50%	2,0
Exam	bdb (5)	5.0 * 50%	2,5
Final result			4,5
Grade		4,5/5 = 90%	**db+ (4,5)**

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

(Laboratory work)

1. Signals in teleinformatics: Determined and Stochastic signals. Noise. Signal parameters. Elements of the Information Theory;

2. Transmission modulations. Analog modulations include AM, FM, PM and derived manipulation. PCM and DM digital modulation. Co-ders and Set-Top Box. Decision-making and interpolation. Optimal coding;

3. Primary and advanced DSP algorithms.

11. Required teaching aids:

a. Lecture - multimedia projector.

b. Laboratory classes - specialist laboratory.

c. Exercises - a room adapted for conducting classes in the form of exercises / workshops, multimedia projector.

12. Literature:

a. Basic literature:

1.Yuriy Shmaliy; Continuous-Time Signals; ISBN 978-1-4020-4818-0; Springer 2006

2. Wasyl Wasylkiwskyj; Signals and Transforms in Linear Systems Analysis; ISBN 978-1-4614-3287-6; Springer, New York, NY 2013

b. Supplementary literature:

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

2. Ulrich Karrenberg; Signals, Processes, and Systems; ISBN 978-3-642-38053-2; Springer, Berlin, Heidelberg 2013

3. Apurba Das; Signal Conditioning; ISBN 978-3-642-28818-0; Springer 2012

4. Marcel J.M. Pelgrom; Analog-to-Digital Conversion; ISNB 978-1-4614-1371-4; 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 Principlesof Data Acquisition and Conversion - https://www.ti.com/lit/an/sbaa051a/sbaa051a.pdf

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	