Subject programme

1. Subject name / subject module: **Digital 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				38	50	3,5																**3,5**
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	38
Preparation to laboratory classes	30
Independent study of the subject	20
Participation in an exam / graded assignment	-
Total student workload (TSW)	88
ECTS credits	3,5
* Student's workload related to trainings	88
Student's workload in classes requiring direct participation of academic teachers	38

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 digitized discrete-time sampled signals, and is able to apply this knowledge in practice through the selection of a suitable DSP techniques for an applicati**	**Laboratory work**	**Inquiry methods**	**Student learning activities**
K_W08	**A student possesses adequate theoretical and practical knowledge on DSP algorithms, and about the role of those algorithms in control systems.**			
Skills				
K_U08	**A student has sufficient skills to apply digital signal processing for measurement systems and to use computer software as a DSP tool.**	**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. Digital filtration;

2. Correlation analysis and matched filtration;

3. Frequency signal processing - DFT, DCT, DST;

4.Time-frequency processing - Transformats: STFT, Hilbert, Gabor, Wavelet, Sizing DFT;

5. Data compression and synchronization basics of digital signal processing and the structure of digital data communication systems.

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

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

b. Supplementary literature:

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

2. Jose Maria Giron-Sierra; Digital Signal Processing with Matlab Examples, Volume 1; ISBN 978-981-10-2534-1; Springer 2017

3. Jose Maria Giron-Sierra; Digital Signal Processing with Matlab Examples, Volume 2; ISBN 978-981-10-2537-2; Springer 2017

4. 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 - www.ti.com/lit/an/sbaa051a/sbaa051a.pdf

4. A Beginner's Guide to Digital Signal Processing - www.analog.com/en/design-center/landing-pages/001/beginners-guide-to-dsp.html

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	