Subject programme

1. Subject name / subject module: **Signal Processing with LabView**
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: **Ocetkiewicz Tomasz, mgr 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:

Mode of study	Teaching activities with the tutor												Total
	Form of classes												
	...	SOW	ECTS	Laboratory work	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	ECTS
Full-time studies				34	41	3							**3**
Part-time studies													
Credit rigor				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	-
Participation in laboratory classes	34
Preparation to laboratory classes	31
Independent study of the subject	-
Preparation of final project	10
Participation in an exam / graded assignment	-
Total student workload (TSW)	75
ECTS credits	3
* Student's workload related to practical forms	75
Student's workload in classes requiring direct participation of academic teachers	34

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_W02	**Student possesses sufficient knowledge of automation, electronics, and electrical engineering, necessary to understand signal processing in process control and automation and to apply this knowledge in practice through the use of appropriate tools to choose and implement proper signal processing algorithms for different applications.**	**Laboratory work**	**Inquiry methods**	**Student learning activities**
K_W05	**The student knows and understands selected facts and phenomena in digital signal processing, and possesses sufficient knowledge to prepare a solution that meets all the design specifications.**			
Skills				
K_U03	**The student has sufficient skills to plan and carry out experiments, including data acquisition and signal processing either using existing methods and tools or developing new ones, analyze data, and draw conclusions.**	**Laboratory work**	**Inquiry methods**	**Student learning activities**

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

Activity	Grades	Calculation	To final
Final project	bdb (5)	5 * 50%	2,50
Tasks done during laboratories	dst, db, bdb (3,4,5)	arithmetic mean (3,4,5) * 50%	2,00
Final result			4,50

0 – 3.00	ndst	**4.01 – 4.50**	db
3.01 – 3.50	dst	**4.51 – 4.7**	db+
3.51 – 4.00	dst+	**4.71 – 5.0**	bdb

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

a. Laboratory work:

1. Introduction to LabView: building a simple VI, structures and subVIs, building a front panel (controls,indicators), building a block diagram(express VI,terminal icons,wires,structures), debugging(probe tool,profile tool), building a system VI with Express VIs, building a system VI with regular VIs VISA.
2. Getting a signal into LabView: data aquisition hardware, sampling and quantization, signal reconstruction, fast fourier transform, aliasing, windowing, discrete fourier transform, short-time fourier transform, discrete wavelet transform.
3. Digital filters digital filter design toolkit, analysis of filter design, FIR filtering systems design with DFDT, IIR filtering systems design with DFDT, building an filtering system using filter coefficients, filter design without DFDT.
4. Adaptive filtering: system indentification, noise cancellation.
5. Generating signals with LabView: basic functions, sinc function, chirp sequence, white gaussian noise.

11. Required teaching aids:

a. Lecture - multimedia projector

b. Laboratory classes - specialist laboratory

12. Literature:

a. Basic literature:

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

2. Frédéric Cohen Tenoudji; Analog and Digital Signal Analysis; ISBN 978-3-319-42382-1; Springer 2016

b. Supplementary literature:

1. Sozański K.; Digital Signal Processing in Power Electronics Control Circuits; ISBN 978-1-4471-5267-5; Sprinder 2013

c. Internet sources:

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

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

c. 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	Ocetkiewicz Tomasz, mgr inż.
3. Training	
4. Project classes	
5. Workshop classes	
6. Simulation game	
7. Language classes	