Subject programme

1. Subject name / subject module: **Control Systems Design**
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: **Szychta Leszek, prof. dr hab. 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				33	42	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	33
Preparation to laboratory classes	24
Independent study of the subject	18
Participation in an exam / graded assignment	-
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	33

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 has basic knowledge of control systems design apllied in automation, electronics and electrical engineering. Student knows the complex dependencies of mechatronic systems and that are applied in practice**	**Laboratory work**	**Inquiry methods**	**Student learning activities**
K_W08	**A student knows and understands selected specific issues in the control systems design. Student knows how to applly that knowlage in the automation, electronics and electrical engineering related to: designing automation systems, control systems, rob**			
Skills				
K_U08	**A student is able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions at the control systems design**	**Laboratory work**	**Inquiry methods**	**Student learning activities**
K_U14	**A student is able to see problems, imperfections in functioning or newly designed control systems design, identify the problem and formulate a specification of simple solutions for the perceived simple control problems.**			

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

0% - 50%	ndst	80% - 86%	db
51% - 70%	dst	97% - 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) * 100%	4,0
Final result			4,0
Grade		4,0/5 = 80%	**db (4,0)**

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

(Laboratory work)

a. Design of control systems - basic concepts and characteristics. Feedback system – Reminder.
b. Conventional PID regulator
c. Modern PID implementations.
d. Smith predictor.
e. Design limitations for single input and single output systems (SISO).
f. Limitation of frequency methods.
g. Principle of the internal model control.
h. Feedforward control structure.
i. Relay control.

11. Required teaching aids:

a. Lecture - multimed:ia 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. Nose Norman, Control Systems Engeeniring, John Willey&Sons, 2008.

2. Ogata Katsuhiko, Discrete-time control systems, Prentice Hall, 1995.

b. Supplementary literature:

Dort Richard, Bishop Robert, Modern Control Systems, Pearson Prentice Hall, 2008

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	Szychta Leszek, prof. dr hab. inż. Repka Michał, dr inż.