

Subject programme

1. Subject name / subject module: **Expert classes (7th semester)**
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: **Wierzcholski Krzysztof, prof.**
 - 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 ECTS		
	Form of classes																						
	SOW	ECTS	Lecture	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS
Full-time studies			9	16																			
Part-time studies				1																			1
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 lecture	9
Preparation to the test	4
Preparation own written topic	10
Participation in an exam / graded assignment / final grading	2
Total student workload (TSW)	25
ECTS credits	1
* Student's workload related to practical forms	0
Student's workload in classes requiring direct participation of academic teachers	9

7. Implementation notes: recommended duration (semesters), recommended admission requirements, relations between the forms of classes:

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_W16	Student is familiar with the current state and the latest development trends in mechatronics in the field of tribology	Lecture	expository methods	Test, written task
Skills				
K_U15	Student is able to assess the suitability and choose the appropriate methods tools in the field of tribology to solve a simple engineering task in the field of Mechatronics.	Lecture	expository methods	Test, written task

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

0% - 50%	ndst	81% - 90%	db
51% - 70%	dst	91% - 93%	db+
71% - 80%	dst+	94% - 100%	bdb

Activity	Grades	Calculation	To Final
Test	bdb (5)	5*100%	5
Written work on a given topic	bdb (5)	5*50%	2,5

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

(Lecture)

1. **Types of friction, friction hypotheses and basic friction laws.**
2. **Geometric, physical and chemical properties of surface layers of solids and their influence on the friction process and wear.**
3. **Mechanisms of friction and wear of metals, ceramics, polymers and composites used in mechatronic systems.**
4. **Fundamentals of lubrication theory.**
5. **Lubricants, basic types of lubrication.**
6. **Modern technologies of surface engineering in tribology.**
7. **Analysis of selected atypical friction nodes.**
8. **Biotribology.**
9. **Tribology of electrical contacts.**

11. Required teaching aids

Lecture - multimedia projector

12. Literature:

a. Basic literature:

Pawlak Z.:Tribiochemistry of lubricating oils. Elsevier, Amsterdam, 2003.

Sergey ErmakovAlexandr BeletskiiOleg EismontVladimir NikolaevLiquid Crystals in Biotribology. Springer International Publishing Switzerland 2016, - book.

a. Supplementary literature:

Flavin Christopher [et al.]: World Tribology Congress 2009: proceedings. Japanese Society of Tribologists, Tokyo, 2009.

b. Internet sources:

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	Wierzcholski Krzysztof, prof.