Subject programme

1. Subject name / subject module: **Elective Subject: Industry Subject (AR technology)**
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: **Skiba Grzegorz, 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:

Teaching activities with the tutor																						
Mode of study	Form of classes																					Total
	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	Exercises	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	...	SOW	ECTS	ECTS
Full-time studies										11	14											
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 lectures	-
Participation in exercises	11
Preparation to exercises	4
Independent study of the subject	-
Preparation to the final test	8
Participation in an exam / graded assignment	2
Total student workload (TSW)	25
ECTS credits	1
* Student's workload related to trainings	25
Student's workload in classes requiring direct participation of academic teachers	11

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_W16	**A student is familiar with augmented and mixed reality devices and technologies that are used in mechatronics industry.**	**Classes**	**Inquiry methods**	**Final test**
Skills				
K_U03	**A student knows how to operate and maintain augmented and mixed reality devices, such as Google Daydream and Microsoft HoloLens.**	**Classes**	**Inquiry methods**	**Final test**
K_U04	**A student has experience in developing AR/XR applications and use of AR/XR devices while solving practical engineering tasks.**			
K_U15	**A student is able to choose and configure correct environment to develop AR/XR applications, choose the right device and apply appropriate methods in order to solve a simple problem in Mechatronics.**			

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
Final test	bdb (5)	5 * 100%	5,0
Final result			5,0
Grade		5,0/5 = 100%	**bdb (5,0)**

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

(Classes)

1. Introduction to augmented and mixed reality technology;
2. Using Unity environment for multi-platform applications development;
3. Environment configuration for augmented reality - usage and testing with AR/XR goggles: Google Daydream, Microsoft HoloLens;
4. Fast prototyping with assets;
5. Explanation of the terms GameObject, Camera, RayCast;
6. Developing scripts in C#.
7. Creating classes, properties, events;
9. Applying animations to objects'
10. Creating dynamic particles.

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:

- Sharp J.: Microsoft Visual C#. Step by step., Microsoft Press, Redmond, 2015.
- Sinicki A.: Learn Unity for Android Game Development, Apress, Berkeley, 2017.
- Blackman S.: Unity for Absolute Beginners, Apress, Berkeley, 2014.

- Taylor A. G.: Develop Microsoft HoloLens Apps Now, Apress, Berkeley, 2016.

b. Supplementary literature:

- Flavell L.: Beginning Blender, Apress, New York, 2010.
- Craig A. B.: Understanding Augmented Reality, Morgan Kaufmann, Waltham, 2013.

c. Internet sources:

- https://unity.com/learn, Unity learning library
- https://docs.unity3d.com/Manual/index.html, Unity user manual and documentation
- https://brackeys.com/, Game development tutorials database

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	
3. Training	
4. Project classes	
5. Workshop classes	Skiba Grzegorz, mgr inż.
6. Simulation game	
7. Language classes	