Module/Course Syllabus
Program: COMPUTER SCIENCE
Full-time master degree program

Course:	**Interdisciplinary Scientific Project**
Type of the course:	directional
Course code:	I2S3.00
Year:	II
Semester:	3
Form of the degree program:	full-time
Form of classes and number of hours per semester:	30
Lecture	0
Classes	0
Laboratory	0
Project	30
Number of ECTS credits:	2
Form of assessment:	course completion assessment
Course language:	English

Course objective (CO)	
CO1	Acquisition of the ability to design interdisciplinary interactive devices in a teamwork system.
CO2	Acquisition of the ability to implement the known technologies in the teamwork system.
CO3	Acquisition of the ability to prepare research methodology for verification and usability of the developed device.
CO4	Acquisition of the ability to prepare project/scientific documentation.

Prerequisites in terms of knowledge, skills and other competencies	
1	Knowledge of the basic principles of interdisciplinary design.
2	Knowledge of 2D and 3D computer graphics.
3	Knowledge of the basics of embedded systems.
4	Knowledge of the basics of programming IoT applications.
5	Knowledge of C/C++ programming language.

Learning outcomes (LO)	
	In terms of knowledge:

	In terms of skills:
LO 1	Is able to develop a concept of interdisciplinary design combining technologies of 3D computer graphics and IoT devices as well as programming.
LO 2	Is able to implement a device in a team based on a defined concept for the blind.
LO 3	Can develop research methodology.
LO 4	Can analyse the developed solution.
LO 5	Is able to prepare documentation that takes into account all aspects of the classes.
	In terms of social competence:
LO 6	Has the ability to act in an entrepreneurial way.
LO 7	Is ready to take public action, including for people with disabilities.

Course content	
Form of classes – project (P)	
	Course content
P1	Discussion of the concepts of interdisciplinary design and design focused on the visually impaired user. Division into project groups. Presentation of topics related to 3D objects with an interface for people with visual impairments.
P2	Assignment of projects. Define functional and non-functional requirements. Separation of design stages. Development of the concept of interactive 3D objects.
P3	Reverse engineering in the design process. Familiarisation with the station for 3D scanning and data processing. Preparation of objects for digitisation and 3D scanning. Performing post-processing of the point cloud, cleaning and adjusting partial scans, generating mesh models, model processing, model texturing, 3D model export to universal formats.
P4	Modelling and 3D printing. Selection of 3D software and selection of tools for the project implementation. Preparation of a digital 3D object, using a 3D model from the scanning process, adapted to the designed electronic system. Preparing the model for 3D printing and printing the object.
P5	Internet of Things (IoT). Familiarisation with hardware architecture, programming environments, sensors and interfaces for communication. Selection of sensors for data collection. Design of the electronic part and interface. Software development.
P6	Implementation of the design task. Construction of an interactive object: assembly of components for a 3D object, software launch, testing.
P7	Validation. Planning the experiment, developing research scenarios (checking the functionality of the interface and ergonomics of the device). Conducting research.
P8	Development of the final design documentation together with the results of testing an interactive 3D object for people with visual impairments. Presentation of projects and objects. Project evaluation.

Didactic methods	
1	Work in project teams.
2	Working with devices: 3D scanners, 3D printers, IoT system components.
3	Individual work with 3D graphics programs.

Assessment methods and criteria		
Assessment method symbol	**Assessment method description**	**Passing threshold**
A1	Project	51%
A2	Presentation	51%

Required textbooks and other course materials	
1	Jason van Gumster, Blender For Dummies, Wyd. John Wiley & Sons, 2020
2	Evans, B. , Beginning Arduino Programming: Writing Code for the Most Popular Microcontroller Board in the World. Technology In Action, Apress, New York, 2011.
3	Horne R., 3D Printing For Dummies, Wyd. John Wiley & Sons, 2017
Recommended textbooks and other course materials	
1	Bociek B., Blender. Basics of modeling, Wyd. Helion, 2007.
2	Blender - Modeling and sculpting an object for 3d printing, https://cojestgrane.pl/polska/dolnoslaskie/wroclaw/wydarzenie/4v9u/blender-modelowanie-i-rzezbienie-obiektu-do-druku-3d/bylo

3	Kolban, N.,Kolban's Book on ESP32 & ESP8266, 2016.
4	Kubicka S., Kurczyk D., Mielcarek D., The use of 3D laser scanners to design ergonomic workstations, PAK, vol. 56, nr 3, 2010.

Student workload	
Form of activity	**Average number of hours to complete the activity**
Contact hours with the lecturer, including:	30
participation in projects	30
Student's own work, including:	20
preparation for the projects	5
implementation of the system	10
preparation of design documentation	5
Total student workload	50
Total number of ECTS credits	2

Learning outcomes matrix					
Learning outcome	**Reference to learning outcomes defined for the master's program**	**Course objectives**	**Course content**	**Didactic methods**	**Assessment methods**
LO1	I2A_U07 + I2A_U09 +++ I2A_U11 ++ I2A_U17 +++	CO1	P1 - P5	1, 3	A1, A2
LO2	I2A_U10 ++ I2A_U11 +	CO2	P6	1, 2, 3	A1, A2
LO3	I2A_U04 ++ I2A_U11 ++	CO3	P7	1, 2, 3	A1, A2
LO4	I2A_U04 +++ I2A_U08 + I2A_U12 +	CO3	P7	1, 2, 3	A1, A2
LO5	I2A_U03 ++	CO4	P8	3	A1, A2
LO6	I2A_K05 +	CO1, CO2, CO3	P2-P8	1	A1, A2
LO7	I2A_K03 + I2A_K06 +++	CO1	P1-P8	1, 2	A1, A2

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