settings.COURSE_HEADER									
Field of study	**Computer Science**							**Degree level and programme type**	**Master's degree full-time programme**
Specialization/ diploma path	**Biometry and Image Processing**							**Study profile**	academic
Course name	**Biometrics in Human Recognition**							**Course code**	**INF2BRC**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	30			20	30			**No. of ECTS credits**	**6**
Entry requirements									

Course objectives	Students in lecture classes, a specialized laboratories, and a design laboratories will be introduced to advanced topics in biometrics theory and applications. In addition, they will acquire the ability to create biometric systems, including those using virtual and augmented reality.
Course content	Lecture: 1. image acquisition methods. 2. Biometric devices for data collection - sensors. Non-standard biometric features: ear, smell, EEG, ECG. 4. Selected behavioral features: mouth movement; hand movement, fingers, gait, signature. 5. Voice and speech and speaker recognition as biometric traits. 6. Biometrics versus biomedicine. 7. Biometric behavioral-physiological traits (signature, voice). 8. Multimodal biometrics - introduction to modalities combination. 9. Biometrics in animals. Specialised Laboratory: 1. Data acquisition using available devices and sensors. 2. Analysis of the collected data in terms of its applicability in human recognition. 3. Custom implementation of biometric sample classification algorithms. 4. implementation of multimodal system using available devices and artificial intelligence methodologies. Project Laboratory: 1. Discussion of devices used to implement augmented and virtual reality (AR, VR). 2. Introduction to implementation of simple AR/VR algorithms. Pointing out appropriate libraries and environments. 3. Introduction to virtual reality (VR) techniques in biometrics. Introduction to augmented reality (AR) techniques in biometrics 4. implementation of the project using AR/VR technology in the process of human recognition based on the image of his face.
Teaching methods	project method, subject exercises, programming, lecture problem, informative lecture,
Assessment method	Lecture - written exam. Specialist laboratory - introductory tasks performed during the classes of specialist laboratory, written paper, oral answer. Design laboratory - project tasks performed during the classes of the design studio.

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows advanced topics in biometrics	INF2_W03 INF2_W09
LO2	is able to complete the knowledge of biometrics using scientific literature, consolidate the collected information and present it in the form of a paper	INF2_W01 INF2_W03 INF2_W05 INF2_U02 INF2_U11
LO3	is able to put biometric methods into practice by collecting data, testing, and analyzing results using selected methods and systems	INF2_W03 INF2_W04 INF2_W07 INF2_U05 INF2_U06 INF2_U09
LO4	Understands and can present the results of the biometric testing performed in an extended oral presentation, explaining the methods used and conclusions drawn	INF2_U02 INF2_U06 INF2_U11 INF2_K02
LO5	can independently implement a simple algorithm for face detection and recognition using virtual or augmented reality techniques, understands how the device works and can independently assess the quality of the developed solution	INF2_W05 INF2_W06 INF2_U02 INF2_U06 INF2_U07 INF2_U13 INF2_K04

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	written exam, introductory tasks performed during specialist laboratory classes, project tasks performed during design laboratory classes	L, SW, P
LO2	written paper, project tasks carried out in the design studio classes	SW, P
LO3	introductory tasks performed during specialist laboratory classes, project tasks performed during design laboratory classes	SW, P
LO4	oral answer, project tasks carried out in the design studio	SW, P
LO5	project tasks carried out in the design studio classes	P

Student workload (in hours)		**No. of hours**
Calculation	1 - Participation in the lectures - 15x2h	30
	2 - Participation in the specialised laboratories - 15x2h	30

	3 - Participation in design laboratories - 10x2h	20
	4 - Preparation to oral presentation	15
	5 - Participation in consultations	5
	6 - Preparation to exam	18
	7 - Preparation to specialised laboratories	20
	8 - Preparation of the lecture and paper	10
	9 - Exam attendance	2
TOTAL:		**150**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	87 (1)+(2)+(3)+(9)+(5)	3.5
Student workload – practical activities	95 (2)+(3)+(4)+(8)+(7)	3.8

Basic references	1. Wilhelm Burger, Mark J. Burge, Digital Image Processing: An Algorithmic Introduction Using Java. Springer, 2016. 2. R. M. Bolle et al, Guide to biometrics, Springer, 2004.
Supplementary references	1. A. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, 1989. 2. David Zhang, Guangming Lu, Lei Zhang, Advanced Biometrics. Springer, 2018.

Organisational unit conducting the course	Department of Digital Media and Computer Graphics	**Date of issuing the programme**
Author of the programme		May 22, 2020

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW – field work,S – seminar

settings.COURSE_HEADER

Field of study	**Computer Science**							**Degree level and programme type**	**Master's degree full-time programme**
Specialization/ diploma path	**Biometry and Image Processing**							**Study profile**	academic
Course name	**Human-Machine Interaction**							**Course code**	**INF2ICM**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	15				30			**No. of ECTS credits**	**3**
Entry requirements									

Course objectives	The aim of the course is to present issues related to human-machine interaction and information that will allow the design of interfaces for selected ways of human-machine interaction.
Course content	lectures: 1. Introduction to human-machine interaction. 2. Interfaces and methodology for the evaluation of human-machine interfaces. 3. Basic interaction technologies: optical, acoustic, tactile, movement and biometric. 4. Selected input devices and ways of interaction. Practical classes: 1. Motion detection using selected sensors. 2. Face detection in human-machine systems. 3. Practical tasks related to human-machine interfaces. 4. Sample topics: voice control, hand gestures etc. 5. Implementation of human-machine interaction algorithms.
Teaching methods	lecture problem, programming, brainstorming,
Assessment method	L: Test at the end of lectures. Pc: A prerequisite for getting credit is attendance and all exercises provided for in the program. Reports from a specialist workshop apply. Each report is subject to evaluation. Based on individual assessments, the grade from Pc.

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows and understands the concepts associated with human-machine interfaces and ways of interaction	INF2_W05 INF2_U02
LO2	has structured knowledge about the ways of human-machine interaction	INF2_W05
LO3	can use the acquired knowledge for the practical implementation of sample human-machine interfaces	INF2_U02 INF2_U08
LO4	uses the role of interfaces and the importance of human-machine interaction in modern reality	INF2_U08 INF2_K01

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	test, reports	L, Pc
LO2	test	L
LO3	reports	Pc
LO4	reports	Pc

Student workload (in hours)		**No. of hours**
Calculation	1 - Participation in lectures - 15x1h	15
	2 - Participation in classes - 15x2h	30
	3 - Preparation of laboratory or studio reports and / or carrying out homework (homework)	15
	4 - Participation in teacher hours	5
	5 - Implementation of project tasks (including preparation of presentations)	5
	6 - Preparation for passing finale test	5
TOTAL:		**75**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	50 (2)+(1)+(4)	2.0
Student workload – practical activities	50 (2)+(3)+(5)	2.0

Basic references	1. Jia Zhou , Gavriel Salvendy (Eds.) Human Aspects of IT for the Aged PopulationApplications in Health, Assistance, and Entertainment LNCS International Conference, Las Vegas, NV, USA, July 15–20, 2018. 2. Rajkumar R., de Niz D., Klein M., Cyber-physical systems, Addison-Wesley Publ., 2017. 3. Murphy R. R., Disaster robotics, Cambridge London The MIT Press, 2014. 4. Ryszard S Choraś, Image processing and communications challenges, Berlin Springer 2010. 5. Bednarczyk H., Leszek W., Wojciechowicz B., Relacje edukacyjne człowiek-maszyna, Wydaw. Instytutu Technologii Eksploatacji, 1995.
Supplementary references	1. Hollifield B., Oliver D., Nimmo I., HabibiE., The High Performance HMI Handbook, Plant Automation Services, 2008. 2. Guccione S., McKirahan J., Human Machine Interface: Concepts and Projects, Industrial Press, 2016. 3. Yuen P. C. ,Tang Y. Y., Wang P. S., Multimodal: Interface for Human-Machine Communication, World Scientific Publishing Company, 2002. 4. Roth E.M., Bennett K.B., Woods D.D., Human interaction with an “intelligent” machine, International Journal of Man-Machine Studies, November 1987, Pages 479-525. 5. Dudek G., Jenkin M.: Computational Principles of Mobile Robotics , Cambridge University Press, 2000.

	6. HCI International 2016 – Posters' Extended Abstracts: 18th International Conference, HCI International 2016, Toronto, Canada, July 17-22, 2016, Proceedings.	
Organisational unit conducting the course	Department of Digital Media and Computer Graphics	**Date of issuing the programme**
Author of the programme		May 22, 2020

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settings.COURSE_HEADER

Field of study	**Computer Science**							**Degree level and programme type**	**Master's degree full-time programme**
Specialization/ diploma path	**Biometry and Image Processing**							**Study profile**	academic
Course name	**Knowledge processing in expert systems**							**Course code**	**INF2SEK**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	20				15			**No. of ECTS credits**	**2**
Entry requirements									

Course objectives	Presentation of knowledge representation techniques and inference methods used in expert systems. Using appropriate techniques of knowledge representation and inference.
Course content	Lecture: 1. Introduction to expert systems. 2. Knowledge representation and solutions seeking. 3. History and importance of expert systems. 4. The use of expert systems in various types of problems. 5. Advantages and disadvantages of expert systems. 6. Basic elements of the expert system. 7. Knowledge representation in expert systems. 8. Inference techniques in expert systems. 9. Techniques of saving knowledge in expert systems. 10. Knowledge acquisition. 11. Principles of building expert systems. Specialist workshop: 1. Knowledge representation and solutions seeking. 2. Basic elements of the expert system. 3. Knowledge representation in expert systems. 4. Techniques of inference in expert systems. 5. Techniques of saving knowledge in expert systems. 6. Knowledge acquisition. 7. Principles of building expert systems.
Teaching methods	lecture problem, programming,
Assessment method	Lecture - written test. Specialist workshop - reports, completion of tasks from a specialist workshop.

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	A student describes the basic techniques of knowledge representation and inference methods.	INF2_W07
LO2	A student is able to prepare a text containing a discussion of the results of the implementation of a project task.	INF2_U09
LO3	A student knows and is able to describe and use the known methods of knowledge representation for data recording and analysis.	INF2_W07 INF2_U09
LO4	A student is able to identify the problem and apply the appropriate knowledge representation technique.	INF2_U05

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	written test	L
LO2	completion of tasks from a specialist workshop	SW
LO3	written test, completion of tasks from a specialist workshop	L, SW
LO4	completion of tasks from a specialist workshop	SW

Student workload (in hours)		**No. of hours**
Calculation	1 - Participation in lectures - 10x2h	20
	2 - Participation in specialist workshops - 15x1h	15
	3 - Theoretical preparation for SW / reporting	8
	4 - Participation in consultations	2
	5 - Preparation to pass the lecture	5
TOTAL:		**50**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	37 (1)+(4)+(2)	1.5
Student workload – practical activities	23 (2)+(3)	0.9

Basic references	1. Systemy ekspertowe, J. J. Mulawka, Wydawnictwa Naukowo-Techniczne, 1996. 2. Systemy ekspertowe, A. Wakulicz-Deja, A. Nowak-Brzezińska, M. Przybyła-Kasperek, R. Simiński, Akademicka Oficyna Wydawnicza EXIT Andrzej Lang, 2018 3. Introduction to expert systems, P. Jackson, Addison-Wesley Pub, 1999. 4. Expert systems for experts, K. Parsaye, M. Chignell, Wiley, 1988.
Supplementary references	

	1. Inżynieria wiedzy i systemy ekspertowe, red. A. Grzech, K. Juszczyszyn, H. Kwaśnicka, N.t. Nguyen, Lubuskie Towarzystwo Naukowe, 2009. 2. Regułowe systemy ekspertowe, A. Niederliński, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2000. 3. Fuzzy expert systems and fuzzy reasoning, W. Siler, J. J. Buckley, Wiley-Interscience, 2005.	
Organisational unit conducting the course	Department of Digital Media and Computer Graphics	**Date of issuing the programme**
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