COURSE SYLLABUS

1. Program information

Faculty	Faculty of Electrical Engineering and Computer Science
Department	Computer Science
Field of study	Computers and Information Technology
Cycle of studies	Master's Degree
Study Program	Artificial Intelligence & Social Robotics Applied to Global Health

2. Course information

Course name		**AMBIENT INTELLIGENCE AND AUGMENTED REALITY**				
Year of study	1	Semester	2	Type of assessment	Exam	
Course regime		Course category by educational content: DF – Fundamental, DS – Specialization, DC – Complementary				DS
		Course category by optionality: DOB – Compulsory, DOP – Optional, DFA – Elective				DOB

3. Total estimated time (hours allocated to teaching activities)

I a) Number of hours per week	3	Lecture	2	Seminar	-	Laboratory / practical work	1	Project	-
I b) Total number of hours per semester according to curriculum	42	Lecture	28	Seminar	-	Laboratory / practical work	14	Project	-

Distribution of time allocation per semester (hours)	No. hours
II. Individual study	105
III. Examinations	3
IV. Other activities (specify):	-

Total individual study hours (II+III)	108
Total hours per semester (I.b+II+III+IV)	150
Number of credits	6

4. Specific competencies acquired

Transversal competencies	-
Professional / general competencies	CP1 – perform scientific research CP2 – develop product design CP3 – design prototypes CP9 – prepare scientific reports CP10 – conduct research across disciplines

5. Learning outcomes

Knowledge	**Skills**	**Responsibility and autonomy**
The student/graduate identifies and applies specialized concepts and methods at the forefront of the field of human-computer interaction and critically reflects on knowledge regarding human-centered design of intelligent technologies.	The student/graduate designs and implements complex interactive experiences for intelligent systems in physical, virtual, and augmented reality environments. The student/graduate integrates advanced artificial intelligence methods into interactive applications that adapt to users.	The student/graduate assumes responsibility for the design, implementation, and evaluation of human-centered interactive solutions, managing complex design situations involving different user, device, and environment characteristics.

6. **Course objectives** (derived from the grid of specific competencies acquired)

General objective of the course	Development of advanced competencies in scientific research specific to the fields of ambient intelligence and augmented reality as well as the design of interactive systems at the intersection of these two domains.

7. Teaching and learning content

Lectures	No. of hours	Teaching methods	Remarks / Notes
1. Ambient Intelligence 1.1. Introduction 1.1.1. The vision of the field of ambient intelligence: various perspectives from industry and research 1.1.2. Quality characteristics and principles of ambient intelligence systems 1.1.3. Founders and influential researchers in the field of ambient intelligence and relevant international scientific events	2	Presentation, lecture, conversation, exemplification, demonstration	
1.2. Examples of ambient intelligence systems from industry and research 1.3. The concept of everyware. Theses of the everyware vision	2		
1.4. Ambient Media 1.4.1. Introduction 1.4.2. Characteristics of ambient media 1.4.3. Manifestations of ambient media	3		
1.4.4. Devices for creating, distributing, and rendering ambient media: ambient devices 1.4.5. Semantic ambient media 1.4.6. Examples of systems from industry and research	3		
1.5. Proxemic Interactions 1.5.1. Introduction to proxemic interactions for ambient intelligence systems 1.5.2. Design dimensions of proxemic interactions. Architectures and tools 1.5.3. Examples from research	2		
1.6. Attention and Peripheral Interactions 1.6.1. Introduction to peripheral interactions for ambient intelligence systems 1.6.2. Design dimensions of peripheral interactions. Implicit and explicit interactions. The interaction-attention space. Architectures and tools	2		
2. Augmented Reality 2.1. Introduction 2.1.1. Vision of the field of augmented reality; various perspectives from industry and research 2.1.2. Differences from VR and characteristics of augmented reality systems 2.1.3. Devices for augmenting physical reality 2.1.4. Notable figures in augmented reality and relevant scientific events	4		
2.2. The Reality-Virtuality Continuum 2.2.1. Mixed reality 2.2.2. Augmented virtuality 2.2.3. Transitions within the reality-virtuality continuum. User experience of transitions 2.3. Examples of augmented/mixed reality systems from research	4		
2.4. Variations of Computer-Generated and Supported Realities 2.4.1. Extended Reality 2.4.2. Mediated and Multimediated Reality 2.4.3. Sensorimotor Reality 2.4.4. Case study on augmented and mixed reality systems applied to home entertainment	3		
3. Ambient Intelligence and Augmented Reality 3.1. Common characteristics of the visions of ambient intelligence and augmented reality 3.2. Elements of scientific creativity at the intersection of the two fields 3.3. Shared design dimensions for ambient intelligence and augmented reality systems. Examples	3		

Recommended minimum bibliography

1. Mark Billinghurst, Adrian Clark, Gun Lee. 2015. A Survey of Augmented Reality. Foundations and Trends in Human-Computer Interaction 8, 73–272. https://doi.org/10.1561/1100000049
2. Arthur Norman. Ambient Intelligence: From Wearable Devices to the Internet of Things, 1st Ed. 2015. CreateSpace Publishing. https://www.packtpub.com/en-us/product/xr-development-with-unity-9781805128120
3. Radu-Daniel Vatavu. 2022. Are Ambient Intelligence and Augmented Reality Two Sides of the Same Coin? Implications for Human-Computer Interaction. Proceedings of CHI'22 EA, the CHI Conference on Human Factors in Computing Systems Extended Abstracts. New York, NY, USA: ACM, Article no. 362, 1-8. https://doi.org/10.1145/3491101.3519710

4. Radu-Daniel Vatavu. 2022. Sensorimotor Realities: Formalizing Ability-Mediating Design for Computer-Mediated Reality Environments. Proceedings of the 21st IEEE International Symposium on Mixed and Augmented Reality. https://dx.doi.org/10.1109/ISMAR55827.2022.00086
5. Radu-Daniel Vatavu. (2024). AI as Modality in Human Augmentation: Toward New Forms of Multimodal Interaction with AI-Embodied Modalities. Proceedings of ICMI '24, the 26th International Conference on Multimodal Interaction. ACM, New York, NY, USA, 591-595. https://doi.org/10.1145/3678957.3678958

Applications (Laboratory)	**No. of hours**	**Teaching methods**	**Remarks / Notes**
The practical activities consist of designing, implementing, and presenting an interactive software application in the field of augmented reality. For this purpose, each new laboratory session will involve updating the application by implementing new functionalities			
Introductory session on the design and development of augmented reality applications. Familiarization with software tools.	2	Practical work, experiment, discussion, case study	
Design of an interactive augmented reality application. Activities include researching the application topic, selecting the development technology, defining the application objectives, identifying the workflow steps, and establishing methods to validate the proposed objectives.	2		
Implementation of virtual objects within the augmented reality scene.	2		
Implementation of interactions with virtual objects within the augmented reality scene.	2		
Reporting results in the form of a scientific paper.	4		
Project presentation and evaluation.	2	Demonstration	
Attendance at compulsory activities is regulated by USV's "Framework Regulation on Student Assessment". Make-up for mandatory practical activities scheduled during the semester is carried out in accordance with the provisions of this regulation. Practical activities scheduled throughout the semester may be replaced by the completion and presentation of high-complexity projects from the course syllabus, with the approval of the course instructor.			
Recommended minimum bibliography			
1. Anna Braun, Raffael Rizzo. 2023. XR Development with Unity: A beginner's guide to creating virtual, augmented, and mixed reality experiences using Unity, 1st Ed. Packt Publishing. https://www.packtpub.com/en-us/product/xr-development-with-unity-9781805128120 2. Irina Popovici, Radu-Daniel Vatavu, Pu Feng, Wenjun Wu. 2021. AR-TV and AR-Diànshì: Cultural Differences in Users' Preferences for Augmented Reality Television. Proceedings of IMX '21, the ACM International Conference on Interactive Media Experiences. New York, NY, USA: ACM, 50–60. https://doi.org/10.1145/3452918.3458801 3. Radu-Daniel Vatavu, Pejman Saeghe, Teresa Chambel, Vinoba Vinayagamoorthy, Marian Florin Ursu. 2020. Conceptualizing Augmented Reality Television for the Living Room. Proceedings of IMX '20, the ACM International Conference on Interactive Media Experiences. New York, NY, USA: ACM, 1-12. https://doi.org/10.1145/3391614.3393660 4. Adrian Aiordăchioae, Cristian Pamparău, Radu-Daniel Vatavu. 2024. Lifelogging Meets Alternate and Cross-Realities: An Investigation into Broadcasting Personal Visual Realities to Remote Audiences. Multimedia Tools and Applications 83, 46707-46730, Springer. https://doi.org/10.1007/s11042-021-11310-3 5. Helen Papagiannis. 2017. Augmented Human: How Technology Is Shaping the New Reality. O'Reilly Media			

8. Evaluation

Type of activity	**Evaluation criteria**	**Evaluation methods**	**Weight in final grade**
Final evaluation	Correct understanding and critical analysis of specialized concepts used in scientific research in the fields of ambient intelligence and augmented reality. Correct application of methods specific to ambient intelligence and augmented reality research. Degree of novelty and originality of the proposed solutions for designing ambient intelligence and augmented reality systems.	Written test, followed by oral verification of the extent to which the requirements in the written work are met.	50%
Evaluation of ongoing practical actvities	Correct design and functional implementation of an application in the field of augmented reality using techniques specific to this research domain, highlighting scientific creativity. Active participation in practical activities relevant to the specific objectives of the course. Assumes responsibility for decisions made and results of one's own activities, including the responsable and ethical	Project evaluation, systematic observation	50%

	use of AI tools. In exceptional circumstances, at the student's request and with the approval of the practical work instructor, the laboratory activity may be fully or partially substituted by the completion and presentation of high-complexity projects covering topics from the course syllabus or by the preparation and presentation of a complete research paper.		

Physical accessibility: activities are conducted in classrooms and laboratories accessible to wheelchair users via ramps/lifts (USV buildings C/D); **Accessibility of teaching materials:** documents are available in digital PDF format with selectable text and slides with large fonts; **Evaluation accessibility:** ongoing evaluation through projects; possibility of extended time for the written tests and oral verification.

Date	Academic title, Name, Surname, Signature of Course Instructor	Academic title, Name, Surname, Signature of Practical Work Instructor
23.09.2026	Prof. univ. dr. ing. Radu-Daniel VATAVU	Dr. Mihail TERENTI

Date of approval	Academic title, Name, Surname, Signature of Program Coordinator
24.09.2026	Prof. univ. dr. ing. Radu-Daniel VATAVU

Date of departmental approval	Academic title, Name, Surname, Signature of Head of Department
24.09.2026	Prof. univ. dr. ing. Ovidiu-Andrei SCHIPOR

Date of Faculty Council Approval	Academic title, Name, Surname, Signature of Dean
25.09.2026	Prof. univ. dr. ing. Laurentiu-Dan MILICI