

SYLLABUS

1. Data about the study program

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Communications
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Telecommunications Technologies and Systems/ Engineer
1.7 Form of education	Full time
1.8 Subject code	TST-E50.10

2. Data about the subject

2.1 Subject name	Development of 2D/3D Interactive Environments						
2.2 Subject area	Theoretical area Methodological area Analytic area						
2.3 Course responsible	Assist. Prof. Aurelia CIUPE, Ph.D. Aurelia.Ciupе@com.utcluj.ro						
2.4 Teacher in charge with laboratory / project	Assist. Prof. Aurelia CIUPE, Ph.D. Aurelia.Ciupе@com.utcluj.ro						
2.5 Year of study	IV	2.6 Semester	1	2.7 Assessment	V	2.8 Subject category	DS/DO

3. Estimated total time

3.1 Number of hours per week	4	of which: 3.2 course	2	3.3 seminar / laboratory	2
3.4 To Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar / laboratory	28
Distribution of time					Hours
Manual, lecture material and notes, bibliography					10
Supplementary study in the library, online specialized platforms and in the field					4
Preparation for seminars / laboratories, homework, reports, portfolios and essays					10
Tutoring					3
Exams and tests					3
Other activities:					
3.7 Total hours of individual study	44				
3.8 Total hours per semester	100				
3.9 Number of credit points	4				

4. Pre-requisites (where appropriate)

4.1 curriculum	Basic courses in electrical and electronic engineering from TTS or AE Curricula. Knowledge of digital signal processing, television, software (C based programming), audio-video analog signal handling (acquisition and conversion), Basic processor architecture
4.2 competence	Use of electronic test and measurement instruments and computing technique

5. Requirements (where appropriate)

5.1. for the course	
5.2. for the seminars / laboratories / projects	

6. Specific competences

Professional competences	C4. Design, implementation and operation of data, voice, video and multimedia services. This is based on the understanding and the application of fundamental concepts in telecommunications and transmission of information C5. Selecting, installing, configuring and operating fixed or mobile telecommunications equipment. Equipping a site with usual telecommunications networks
Transversal competences	N / A

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	To develop competences in designing 2D/3D interactive 2D/3D environments.
7.2 Specific objectives	1. Designing 2D/3D interactive environments: UI/UX, prototyping, level design, principles of mechanics and dynamics 2. 2D/3D game-specific interactive graphic elements: scene, components, materials, interaction and collisions, UI, particle systems, characters, animations

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction. Themes of DIE2D/3D.		
2. Taxonomy of game-specific interactive 2D/3D graphic environments.		
3. Case studies C2.		
4. Storytelling and narration in game-specific interactive 2D/3D graphic environments.		
5. Case studies C4.		
6. Game mechanics and design principles for game-specific interactive 2D/3D graphic environments.		
7. Case studies C6.		
8. Game engines for game-specific interactive 2D/3D graphic environments.		
9. Case studies C8.		
10. Interfaces and interaction in game-specific interactive 2D/3D graphic environments.		
11. Case studies C10.		
12. Product and project principles in the development of game-specific interactive 2D/3D graphic environments.	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentation, projector, blackboard

13. Case studies C12.		
14. Review of the course themes and exam preparation		
References 1. Tekinbas, K. S., & Zimmerman, E. (2003). <i>Rules of play: Game design fundamentals</i>. MIT press. 2. Foley, J. D. (1996). <i>Computer graphics: principles and practice</i> (Vol. 12110). Addison-Wesley Professional. 3. Gregory, J. (2018). <i>Game engine architecture</i>. AK Peters/CRC Press. 4. A. Ciupe, et al., (2023, May). From Speaking Skills to Virtual Mobilities: Challenges of VR Technologies in Communication from the European University of Technology. In 2023 IEEE Global Engineering Education Conference (EDUCON) (pp. 1-4). IEEE. 5. G. Ciucă, A. Ciupe, B. Orza, (2022, November). Exploring Educational Scenarios through Interactive Environments and Agile User Stories: a Gamified Assessment Case Study. In 2022 International Symposium on Electronics and Telecommunications (ISETC) (pp. 1-4). IEEE. 6. A.M. Ruscanu, A. Ciupe, S.N. Meza, (2022, March). " arPcTECHture"—a gamified educational 3D virtual world for introductory concepts in computer architecture. In 2022 IEEE Global Engineering Education Conference (EDUCON) (pp. 1437-1442). IEEE. 7. A. Ciupe, S. Meza, B. Orza, B. (2021). Systematic assessment of interactive instructional technologies in higher engineering education. In <i>Educating Engineers for Future Industrial Revolutions: Proceedings of the 23rd International Conference on Interactive Collaborative Learning (ICL2020)</i>, Volume 1 23 (pp. 797-804). Springer International Publishing. 8. Vajdea, B., Ciupe, A., Orza, B., & Meza, S. (2020). Educational Driving Through Intelligent Traffic Simulation. In <i>Intelligent Tutoring Systems: 16th International Conference, ITS 2020, Athens, Greece, June 8–12, 2020, Proceedings 16</i> (pp. 420-426). Springer International Publishing. 9. Stroe, I. P., Ciupe, A., Meza, S. N., & Orza, B. (2019, April). FireEscape: a gamified coordinative approach to multiplayer fire-safety training. In 2019 IEEE Global Engineering Education Conference (EDUCON) (pp. 1316-1323). IEEE. 10. Salomia, A., Ciupe, A., Meza, S., Orza, B., & Trifan, G. (2018, May). Assistive AR technology for hearing impairments in driving lessons. In 2018 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR) (pp. 1-6). IEEE. On-line references 1. Digital Workspace Microsoft Teams		
8.2 Laboratory	Teaching methods	Notes
1. Introduction in laboratory concepts. Lab organization.	Didactic and experimental proof, didactic exercise, teamwork	Use of laboratory instrumentation, experimental boards, computers, multimedia board
2. 2D/3D game engines. Introduction in the project workspace.		
3. 2D/3D game engines. Scene and assets.		
4. 2D/3D game engines. Scene interaction.		
5. 2D/3D game engines. UI Elements.		
6. Requirements for game-specific interactive 2D/3D graphic environments. Agile methodologies.		
7. Portofolio evaluation.		
8.3 Project		
1. Introduction in project tasks. Project organization.		
2. Rapid prototyping for game-specific interactive 2D/3D graphic environments.		
3. User experience in game-specific interactive 2D/3D graphic environments.		
4. Project development (1/3).		
5. Project development (2/3).		
6. Project development (3/3).		

7. Project evaluation.		
Bibliography		
1. Digital Workspace Microsoft Teams		

9. Bridging the course contents with the expectations of the representatives of the community, professional associations and employers in the field

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale / Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	<i>Written assignment (theory and case studies)</i>	<i>T 50%</i>
10.5 Seminar/ Laboratory	The level of acquired knowledge and abilities	<i>Laboratory portfolio/ Project evaluation</i>	<i>L 25% P 25%</i>
10.6 Minimum standard of performance			
Qualitative level: <i>Minimal knowledge:</i> ✓ To know the basics of ✓ Knowledge of the most important generic architectures in media processing ✓ Use of simulation (Minimal competencies: ✓ To connect the development ✓ Use of computer equipment to control and setup of embedded applications Quantitative level: ✓ Attendance of all laboratory and project sessions ✓ Evaluation in exam (T) and practical activities (L+P)/2 at least 4.5 points/out of 10. ✓ Final grade is computed with the formula: $0,5 \cdot T + 0,25 \cdot L + 0,25 \cdot P$			

Date of filling in:	Responsible	Title First Name SURNAME	Signature
16.06.2025	Course	Assist. Prof. Aurelia CIUPE, Ph.D.	
	Applications	Assist. Prof. Aurelia CIUPE, Ph.D.	

Date of approval in the Council of the Communications Department 18.06.2025	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of the Faculty of Electronics, Telecommunications and Information Technology 25.06.2025	Dean Prof. Ovidiu POP, Ph.D.