



DISCIPLINE ACADEMIC SHEET
ACADEMIC YEAR 2025 – 2026

1. PROGRAMME DATA

1.1. Higher Education Institution	UNIVERSITY OF CRAIOVA
1.2. Faculty	Automation, Computers and Electronics
1.3. Department	Computers and Information Technology
1.4. Field of Study	Computers and Information Technology
1.5. Study level	L(License / Undergraduate)
1.6. Organizational form	IF
1.7. Study Program (name/code) /Qualification	Computers / L2060101010

2. DISCIPLINE DATA

2.1 Discipline Name	Computer Graphics						
2.2 Course Activities Holder	Tănăsie Răzvan						
2.3. Practical Activities Holder	Tănăsie Răzvan						
2.4. Study Year	2	2.5. Semester	2	2.6. Evaluation type	E	2.7. Discipline regime	DOB

3. ESTIMATED TOTAL TIME (hours per semester of teaching activities)

3.1. Number of hours per week	4	in which: 3.2 course	2	3.3. sem./lab./pr.	2
3.4. Total hours of curriculum	56	in which: 3.5 course	28	3.6. sem./lab./pr.	28
3.7. Time distribution - hours/week					hours
Study after manual, course support, bibliography and notes					14
Additional documentation in library, on specialized electronic platforms and field					5
Training seminars / labs, homework, portfolios and essays					14
Tutorial					1
Examinations					1
Other activities.....					9
Total hours per individual activities					44
3.8. Total hours per semester					100
3.9. Number of credits					4

4. PRECONDITIONS (where appropriate)

4.1. of curriculum	Computer programming and programming languages, mathematical analysis, physics I - general physics, data structures and algorithms
4.2. of competence	Good knowledge of the C# programming language

5. CONDITIONS (where appropriate)

5.1. of the course	The course is taught using the video projector. The board is used for some explanations and answers to questions
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	from the audience. The presentations and auxiliary bibliographic material are provided in electronic format
5.2. of seminar/ laboratory/project	Computing equipment allowing the editing and compilation of programs written in C# and run in the Unity development environment

6. COURSE OBJECTIVES – expected learning outcomes that are supported by completing and passing the course

Knowledge	The student/graduate: 1. Uses computer graphics engines to build graphics applications for consoles, mobile devices and personal computers 1.1. Includes a renderer for 2D or 3D graphics, a physics engine or collision detection (and collision response), sound, scripting, animation, artificial intelligence, networking, streaming, memory management, threading, localization support, a scene graph and may include video support for cinematics. 1.2. Learns to control the rendering engine that generates animated 3D graphics through any of several methods (rasterization, ray-tracing etc.). 2. Learns the development process of a video game by reusing/adapting, to a large extent, the same game engine to produce different games or to help port games to multiple platforms. 2.1. Describing the structure and operation of computer graphics systems. 3. Solves problems using computer science and engineering tools. 3.1. Identifying a class of problems and solving methods specific to computing systems. 3.2. Developing and implementing computer-based solutions for specific problems. 4. Improving the performance of software and graphics systems. 4.1. Choosing the criteria and methods for evaluating the performance of software and graphics systems. 5. Designs and manages the lifecycle, integration and integrity of software and graphics systems. 5.1. Adequately uses quality standards and efficient programming in computer graphics.
Skills (Abilities)	The student/graduate elaborates models for different components of computing systems, hardware and software, and evaluates the functional and non-functional characteristics. The student/graduate uses specific methods and tools for the analysis, design and implementation of acquisition systems, graphic processing systems, data processing and display systems. The student/graduate designs and implements functional systems of small/medium complexity with microprocessors.
Responsibility and autonomy	The student/graduate shows a spirit of initiative and action for updating professional, economic and organizational culture knowledge.

7. CONTENT

7.1. Course	The method of implementation	Teaching methods	Allocated time (hours)
1. Computer graphics - Overview	face to face	Slide presentation	2
2. 2D graphics - Lines. The Bresenham algorithm. Polygons. Filling algorithms. Transformations in the plane. Geometric transformations. Coordinate transformations	face to face	Slide presentation	4
3. 3D graphics - General notions. Euclidean transformations in 3D.	face to face	Slide presentation	4

Elementary notions: Lighting. Color. Surface properties. Cameras. Coordinate systems. Clipping. Rasterization. Hidden surface determination. Rendering			
4. Gaming - General notions	face to face	Slide presentation	2
5. Applied mathematics in computer graphics. Transformations. Quaternions. Transformation spaces	face to face	Slide presentation	4
6. Game design. Color theory. Textures. Animations. Chromatic contrasts. Design elements. Design principles in games.	face to face	Slide presentation	4
7. Animations - General notions	face to face	Slide presentation	2
8. Introduction to the Unity working environment	face to face	Slide presentation	2
9. Advanced graphics notions: Vulkan IDE, HDR, real-time ray tracing	face to face	Slide presentation	2
10. Design patterns in computer graphics	face to face	Slide presentation	2
Bibliography:			
1. Foley.J et al Computer Graphics: Principles and Practice (3rd Edition) 3rd Edition,Addison-Wesley Professional; 3 edition (July 20, 2013) 2. W.Schroeder,Visualization Toolkit: An Object-Oriented Approach to 3D Graphics, 4th Edition 4th Edition, 2013 3. Hans J. Johnson et al.The ITK Software Guide,Book 2: Design and Functionality Fourth Edition ,Updated for ITK version 4.13.0 4. Burgun, Keith. Game Design Theory: A New Philosophy for Understanding Games. Publisher: A K Peters/CRC Press 2012. ISBN 978-1466554207 5. Kankaanranta, Marja Helena. Design and Use of Serious Games (Intelligent Systems, Control and Automation: Science and Engineering). Springer 2009. ISBN 978-9048181414. 6. Norman, Donald A. The Design of Everyday Things. Basic Books 2002. ISBN 978-0465067107 7. Peek, Steven. The Game Inventor's Handbook. Betterway Books 1993. ISBN 978-1558703155 8. Oxland, Kevin (2004). Gameplay and design. Addison Wesley. ISBN 978-0-321-20467-7.			

7.2. Seminar/laboratory/project	The method of implementation	Teaching methods	Allocated time (hours)
1. The Unity Graphics Engine - Introduction	face to face	Work at the graphics workstation	4
2. Generating the first 3D model	face to face	Work at the graphics workstation	4
3. Camera control and GUI example	face to face	Work at the graphics workstation	4

4. Surface rendering and setting the lights	face to face	Work at the graphics workstation	4
5. Example 1: 3D game	face to face	Work at the graphics workstation	4
6. Animation example	face to face	Work at the graphics workstation	4
7. Example 2: 3D game	face to face	Work at the graphics workstation Work at the graphics workstation	4
Bibliography:			
1. Foley,J et al Computer Graphics: Principles and Practice (3rd Edition) 3rd Edition,Addison-Wesley Professional; 3 edition (July 20, 2013) 2. W.Schroeder,Visualization Toolkit: An Object-Oriented Approach to 3D Graphics, 4th Edition 4th Edition, 2013 3. Hans J. Johnson et al.The ITK Software Guide,Book 2: Design and Functionality Fourth Edition ,Updated for ITK version 4.13.0 4. Burgun, Keith. Game Design Theory: A New Philosophy for Understanding Games. Publisher: A K Peters/CRC Press 2012. ISBN 978-1466554207 5. Kankaanranta, Marja Helena. Design and Use of Serious Games (Intelligent Systems, Control and Automation: Science and Engineering). Springer 2009. ISBN 978-9048181414. 6. Norman, Donald A. The Design of Everyday Things. Basic Books 2002. ISBN 978-0465067107 7. Peek, Steven. The Game Inventor's Handbook. Betterway Books 1993. ISBN 978-1558703155			

8. Correlating the content of the discipline with the expectations of representatives from the epistemic community, professional associations and representative employers in the field related to the program

Elementary knowledge related to 3D graphics - Elementary knowledge related to computer game design - Elementary knowledge related to the Unity development environment

9. EVALUATION

Activity Type	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Final mark weight
9.4. Course	- Knowledge of the standards governing computer graphics - Knowledge of the mathematical notions behind computer graphics - Knowledge of the algorithms used for computer rendering	Multiple-choice exam with single-answer or multiple-answer questions	70%
9.5. Seminar/laboratory/project	- Understanding computer graphics - Correct implementation of computer game example 1 -	Grading within the laboratory activity	10%

	Understanding computer graphics - Correct implementation of computer game example 2 - Understanding computer graphics - Correct implementation of computer game example 3		
9.6. Minimum standard of performance			
- Written exam grade at least 5, laboratory activity grade at least 5, final grade at least 5			

Date of Completion	Signature of the Course Activities Holder,	Signature of the Practical Activities Holder,
23.08.2025	Tănasie Răzvan	Tănasie Răzvan

Date of Approval in the Department	Signature of the Department Director,
25.08.2025	Ș.l.dr.ing. Nicolae ENESCU

Date of Approval in the Faculty	Signature of the Dean,
	Prof.dr.ing. Dorin ȘENDRESCU