SUBJECT SHEET

Academic Year 2024-2025

Year III / Semester I

1. Program data

1.1. Educational institution	**"1 December 1918" University**
1.2. Faculty	**Faculty of Informatics and Engineering**
1.3. Department	**Department of Computer Science, Mathematics and Electronics**
1.4. Field of study	**Computer science**
1.5. Cycle of studies	**License**
1.6. Study program	**Computer Science,** **ESCO-08: 2511/ Systems Analyst, 2512/ Software developers** **Analyst 251201** **Computer System Programmer 251204** **Computer System Engineer 251203**

2. Discipline data

2.1. Name of the discipline	**Computer graphics**				2.2. Disciplinary Code	CSE 302	
2.3. Owner of the course activity			**Prof. Univ. dr. ing. EMILIAN CEUCA**				
2.4. Owner of the seminar activity			Asist. Univ. drd. Capalnas Matei				
2.5. Year of study	**III**	2.6. Semester	**I**	2.7. Type of assessment (E/C/VP)	**E**	2.8. Discipline regime (**C** – compulsory, **Op** – optional, **F** – optional)	**C**

3. Total estimated time

3.1. Number of hours per week	**4**	of which: 3.2. course	***2***	3.3. Seminar/Laboratory	***2***
3.4. Total hours of the curriculum	**56**	of which: 3.5. course	***28***	3.6. Seminar/Laboratory	***28*** .
Distribution of the time fund					Hours
Study by textbook, course material, bibliography and notes					***52***
Additional documentation in the library, on specialized electronic platforms and in the field					***10***
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					***30***
Tutoring					***-***
Examination					***2***
Other activities					***-***

3.7 Total individual study hours	**94**
3.8 Total hours of the curriculum	**56**
3.9 Total hours per semester	**150**
3.10 Number of credits	**6**

4. **Preconditions** (where applicable)

4.1. Curriculum	
4.2. Competences	-

5. **Conditions** (where applicable)

5.1. Course Conduct	***The course will take place Physically on the TEAMS platform (students receive a link on the e-mail address with the meeting details and access information)***
5.2. the conduct of the seminar/laboratory	

6. Specific skills gained

Professional skills	**C4.1** Definition of concepts, principles and methods used in the fields of: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer system architecture, programmable electronic systems, graphics, reconfigurable hardware architectures **C4.2** Explanation and interpretation of the specific requirements of hardware and software structures in the fields of: computer programming, high-level and specific languages, CAD

	techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures **C4.3** Identification and optimization of hardware and software solutions to problems related to: industrial electronics, medical, automotive electronics, automation, robotics, production of consumer goods. **C4.4** Use of appropriate performance criteria for the evaluation, including by simulation, of the hardware and software of dedicated systems or service activities using microcontrollers or computing systems of low or medium complexity **C4.5** Design of dedicated equipment in the fields of applied electronics, using: microcontrollers, programmable circuits or simple architecture computing systems, including related programs
Transversal competences	

7. **Objectives of the discipline** (resulting from the grid of specific skills accumulated)

7.1 General objective of the discipline	Study and experimentation of 3D photorealistic graphics algorithms. Development of 2D and 3D graphics applications To accommodate students with the methods and procedures of image modification and processing and optimization criteria. Appropriation of quality standards regarding the creation of multimedia products
7.2 Specific objectives	1. Building the graphic model of a 3D object scene 2. Implementation and use of basic 3D graphics algorithms from the core of a graphics system 3. Building graphical applications in a high-level language (C, C++) using graphical libraries (e.g. OpenGL) 4. Implementation of the main phases of the graphic transformation sequence, for transforming a scene of 3D objects into an image

8. Content

8.1 Course	**Teaching methods**	**Observations**
Introduction. CONCEPTS AND GENERAL NOTIONS	***Lecture, discussions***	
Modeling and representation. Uses of 3D graphics	Multimedia means of teaching are used in the course. The course is interactive with demonstrations to exemplify graphics methods and algorithms. **Students will have their materials uploaded to the Class notebook – available in the cloud**	Consultation hours are planned during the semester and before each exam
Programming languages and equipment used Manipulating 3D objects		
Spatial and plane transformations Coordinate systems2 Spherical coordinates. 3 Cartesian coordinate landmarks attached to the observer		
2D transformations. Graphic libraries. Development of graphic applications		
Object modeling Polygonal object modeling. Representation of polygons. Visualization systems.		
Geometric transformations in space		
Homogeneous coordinate systems. Composition of geometric transformations		
Reflection and lighting patterns Phong reflection pattern. Shading patterns.		
Texturing Application and rendering textures.		
Models of global reflection. Radiation method		
Graphic Animation		
Modeling virtual scenes		
Recap. Presentation of an exam topic		

8.2 Bibliography

EMILIAN CEUCA – Image Processing Course, DIDACTICA Series 2007

EMILIAN CEUCA – Laboratory Supervisor. Digital Image Processing, DIDACTICA Series 2007

Watt A., "3D Computer Graphics". Addison-Wesley, 2000.

Watt A., Policarpo F.:"3D Games. Real-time Rendering and Software Technology". Addison-Wesley, 2001.

Akenine-Moller T., Haines E., "Real-Time Rendering". A.K. Peters 2nd edition, 2002.

Foley J.D., van Dam, A., Feiner, S.K., Hughes, J.F., "Computer Graphics. Principles and Practice". AddisonWesley Pblishing Comp., 1992.

Gorgan D., Rusu, D., "Computer Graphics Elements". Cluj-Napoca, 1996

http://opencv.org		
Seminar-laboratory		
1. Introduction. Administrative organization		Each student develops a project based on the laboratory work
2. Structure of an OpenGL application		
3. Graphics primitives in OpenGL		
4. Graphics transformations in OpenGL		
5. Creation of 3D models.		
6. The lighting model in OpenGL		
7. Texture mapping in OpenGL		
8. Calculating shadows in OpenGL applications		
9. Graphical user interfaces in OpenGL applications.		
10. Graphical user interfaces in OpenGL applications.		
11. Ray-tracing algorithm		
12. Bump mapping		
13. Project support		
Bibliography **8.2 Bibliography**		

9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative of the field related to the program

- The discipline is a discipline of the field, its content being both classical and modern, familiarizing students with the principles of design of 3D graphics systems and algorithms. The content of the discipline was corroborated with other universities and with important companies from Romania, Europe and the USA and evaluated by Romanian government agencies (CNEAA and ARACIS).

10. Assessment

Activity Type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of the final grade
10.4 Course	*Final evaluation*	*Written+Oral Exam (practical test)*	60%
	-	-	-
10.5 Seminar/laboratory	*Checking along the way*	*Protocol (laboratory) + projects - practical works*	40%
	-	-	-
10.6 Minimum Performance Standard:			
- In order to pass the exam, it is necessary to obtain a minimum of points (50 points out of a total of 100 points) - Weight of the laboratory + laboratory projects (min 15 points out of a total of 40 points) / Exam (3 oral subjects -30 p out of a total of 100) - The laboratory ends with the presentation of the portfolio of laboratory works (simulations, practical applications / projects) and will be presented by the student in the last week of activities - The laboratory can recover 50% in the last 3 weeks of teaching activities, but in order to be able to plan, students must prove a written request to the subject holder by week 10, in order to be able to make the recovery schedule. If the student has more than 50% absences from the laboratory, they will be recovered in the arrears session after the same procedure for requesting recovery.			

Date of completion ……

Signature of the course holder
Prof.univ.dr.ing.habil Emilian CEUCA
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Signature of the seminar holder
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Date of approval in the department

Signature of the department director

Date of approval by the Faculty Council
Faculty……..

Signature of the Dean of the
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