SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time
1.8 Subject code	27.

2. Data about the subject

2.1 Subject name	***Computer-aided graphics***				
2.2 Course responsible / lecturer	Prof. dr. eng. Gorgan Dorian - dorian.gorgan@cs.utcluj.ro				
2.3 Teachers in charge of seminars / laboratory / project	Assoc.prof.dr.eng. Ștefănuț Teodor - Teodor.STEFANUT@cs.utcluj.ro Lect. dr. eng. Sabou Adrian - adrian.sabou@cs.utcluj.ro Lect. dr. eng. Nandra Constantin - Constantin.Nandra@cs.utcluj.ro				
2.4 Year of study	II	2.5 Semester	2	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DF
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars	-	Laboratory	2	Project	-
3.2 Number of hours per semester	56	of which:	Course	28	Seminars	-	Laboratory	28	Project	-

3.3 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	6
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
(d) Tutoring	3
(e) Exams and tests	5
(f) Other activities:	0

3.4 Total hours of individual study (suma (3.3(a)...3.3(f)))	44
3.5 Total hours per semester (3.2+3.4)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Computer programming (C language)
4.2 Competence	Applications development in C programming language

5. Requirements (where appropriate)

5.1. For the course	Projector, computer
5.2. For the applications	Laboratory attendance is mandatory. Study of laboratory materials from the server

6. Specific competence

6.1 Professional competences	**C3 –** Problems solving using specific Computer Science and Computer Engineering tools (4 credits) • **C3.1 –** Identifying classes of problems and solving methods that are specific to computing systems • **C3.2 –** Using interdisciplinary knowledge, solution patterns and tools, making experiments and interpreting their results • **C3.3 –** Applying solution patterns using specific engineering tools and mehods • **C3.4 –** Evaluating, comparatively and experimentally, the available alternative solutions for performance optimization • **C3.5 –** Developing and implementing informatic solutions for concrete problems
6.2 Cross competences	N/A

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

7.1 General objective	Learning about the architecture of a graphic system, the study of the graphic pipeline, the study of 2D graphic algorithms
7.2 Specific objectives	1. Creation of the graphical model of a scene of objects 2. Implementation of the basic algorithms that form the core of a graphic system 3. Development of graphic applications in a high-level programming language (C, C++) 4. Implementation of the main phases of the graphic transformation pipeline

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction. History. Examples	2	New multimedia teaching approaches will be used in classes. The course is interactive and includes demonstrations that exemplify graphical methods and algorithms.	During the semester and before each exam there are a few preparation hours planned.
Graphics systems – architecture, standards	2		
Graphics devices – logic and physics devices, input, output and interactive devices	2		
Graphics transformations pipeline – 2D and 3D transformations. Matrix operators	2		
Mathematics in computer graphics	2		
Lines scan conversion algorithms	2		
Circles scan conversion algorithms	2		
Polygons scan conversion algorithms	2		
Clipping algorithms – point, line, polygon and text	2		
Projections and viewing transformations	2		
Photorealistic presentation of 3D objects – concepts, algorithms, examples	2		
Color models – color perception, color space and standards, color in software design	2		
Graphics formats – vector and raster formats, data compression , Web technologies	2		
Graphics pattern grammars	2		

Bibliography:

1. Foley J.D., van Dam, A., Feiner, S.K., Hughes, J.F., "*Computer Graphics. Principles and Practice*". Addison-Wesley Publishing Comp.
2. Watt A., "*3D Computer Graphics*". Addison-Wesley.

In virtual library: Course resources, https://moodle.cs.utcluj.ro/

8.2 Applications - Seminars / Laboratory / Project	Hours	Teaching methods	Notes

Introduction to SDL	2	Documentation and examples will be available to the students, prior to the laboratory classes, on a dedicated server. The students will work independently but will also be assisted by the teacher.	Each student will have to develop a specific project based on the knowledge acquired at the laboratory hours.
Mathematics in computer graphics: vectors	2		
Mathematics in computer graphics: matrices	2		
Graphics transformations	2		
Graphics transformations in SDL	2		
Line rasterization using the Bresenham algorithm	2		
Clipping algorithms for graphical primitives	2		
Viewing transformations	2		
Triangle rasterization using barycentric coordinates	2		
Intermediate assessment	2		
Hidden surface removal using the z-buffer algorithm	2		
Bezier curves	2		
Color computation	2		
Final assessment	2		
Bibliography *In virtual library:* Course and practical works, https://moodle.cs.utcluj.ro/			

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

This discipline is integrated into the Computers and Information Technology domain. The content is classic, yet modern, and introduces to students the fundamentals of graphic systems and 2D algorithms. The content of this discipline has been aligned with the information presented in similar disciplines from other major universities and companies from Romania, Europe and USA and has been evaluated by the authorized Romanian governmental agencies (CNEAA and ARACIS).

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	The written exam evaluates the understanding of the information presented in classes and the ability to apply this knowledge. The activity in class evaluates the active involvement of the students in the teaching process and their participation to the discussions, debates and other class activities during the entire semester.	Evaluation is performed through written exam and activity at the course.	50% (E) 10% (AC)
Laboratory	Laboratory assessment evaluates the practical abilities obtained by the students. Through homework assignments the students have the opportunity to develop their skill in applying the notions, concepts and methods presented in class.	Evaluation is performed through written and practical exam.	40% (L)
Minimum standard of performance: Graduation requirement: M≥5; final mark M=0.5*E+0.4*L+0.1*AC Condiția de participare la examen: L≥5			

Date of filling in:	Responsible	Title, First name Last name	Signature
Date of filling in: 26.02.2025	Course	Prof.dr.eng. Dorian GORGAN	
	Applications	Assoc.prof.dr.eng. Teodor ȘTEFĂNUȚ	
		Lect.dr.eng. Adrian SABOU	
		Lect.dr.eng. Constantin NANDRA	

Date of approval in the department	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan