

FIȘA DISCIPLINEI

Denumirea disciplinei :		ADVANCED COMPUTER GRAPHICS			
Codul disciplinei:					
Programul de studii:		ADVANCED COMPUTING SYSTEMS			
Catedra:		CATEDRA DE CALCULATOARE ȘI AUTOMATIZĂRI			
Facultatea:		FACULTATEA DE INGINERIE „Hermann Oberth”			
Universitatea:		UNIVERSITATEA „Lucian Blaga” din SIBIU			
Anul de studiu:	I	Semestrul	1	Tipul de evaluare finală	examen
Regimul disciplinei (DI=obligatorie/ DO=opțională/DF=liber aleasă):			DI	Numărul de credite:	10
Categoría formativă a disciplinei (DF=fundamentală.; DI=ingierești; DS=specialitate; DC=complementară)					DS
Total ore din planul de învățământ	4			Total ore pe semestru:	56
Titularul disciplinei: Conf. Dr. Ing. Rodica Baci					

Numărul total de ore (pe semestru) din planul de învățământ					
Total ore/ semestru	C	S	L	P	Total
	2		2		4

Obiective:	This advanced course demonstrates sophisticated and novel computer graphics programming techniques, implemented in C using the widely available OpenGL library. By explaining the concepts and demonstrating the techniques required to generate images of greater realism and utility, the course helps students achieve two goals: they gain a deeper insight into computer graphics concepts and OpenGL functionality, while expanding their “tool-box” of useful OpenGL techniques.
Competențe specifice disciplinei	1. Cunoaștere și înțelegere: <ul style="list-style-type: none"> • Understanding the way of using of an 3D graphics application • Understanding of implementing of a 3D library. •
	2. Explicare și interpretare: <ul style="list-style-type: none"> • Understanding the way of projection of a 3D application • Knowledge of using of 3D algorithms
	3. Instrumental – aplicative <ul style="list-style-type: none"> • Using OpenGL library • Expanding their “tool-box” of useful OpenGL techniques.

4. Atitudinale:

- Developing the capacity of hard intellectual work.

Conținutul tematic (descriptori)	TEMATICA CURSURILOR		
	Nr. crt.	Denumirea temei	Nr. ore
	1.	Modelling Decomposition and Tessellation. Generating Model Normals. Triangle stripping. Capping Clipped Solids with the Stencil Buffers. Constructive Solid Geometry with the Stencil Buffers.	4 hours
	2.	Geometry and Transformations Stereo Viewing. Depth of field. The Z Coordinate and Perspective Projection.	2 hours
	3.	Texture Mapping Mipmap Generation. Filtering. Anisotropic Texture Filtering. Paging Textures. Billboards. Texture Coordinate Generation. Colour Coding and Contouring. Projective Textures. 3D Textures. Line Integral Convolution with Texture. Procedural Texture Generation.	4 hours
	4.	Blending Compositing. Advanced Blending. Blending with the Accumulation Buffer.	2 hours
	5.	Antialiasing Line and Point Antialiasing. Polygon Antialiasing. Antialiasing with Textures. Antialiasing with the Accumulation Buffer.	2 hours
	6.	Lighting Phong Shading. Light Maps. Other Lighting Models. Global Illumination. Choosing Materials Properties.	2 hours
	7.	Scene Realism Motion Blur. Depth of Field. Reflections and Refractions. Creating Shadows.	2 hours
	8.	Transparency Screen-Door Transparency. Alpha Blending. Sorting. Using the Alpha Function. Using Multisampling.	2 hours
	9.	Natural Phenomena Smoke. Vapour Trails. Fire. Explosions. Clouds. Water. Light Points. Other Atmospheric Effects. Particle Systems.	2 hours
	10.	Image Processing The Pixel Transfer Pipeline. The Framebuffer and Per-Fragment operations. Colours and Colour Spaces. Convolutions. Image Warping.	2 hours
	11.	Using the Stencil Buffer Dissolve with Stencil. Decaling with Stencil. Finding Depth Complexity with the Stencil Buffer. Compositing Images with Depth.	2 hours

	12	Line Rendering Techniques Wireframe Models. Hidden Lines. Haloed Lines. Silhouette Edges.	2 hours
		TOTAL	28 hours
	Practical works		
	1.	Constructive Solid Geometry with the Stencil Buffers in OpenGL.	2 hours
	2.	Computing the Transforms in OpenGL.	2 hours
	3.	Billboards.	2 hours
	4.	How to Project a Texture in OpenGL.	2 hours
	5.	Spectral Synthesis. Turbulence.	2 hours
	6.	Blending with the Accumulation Buffer in OpenGL.	2 hours
	7.	Antialiasing with the accumulation Buffer.	2 hours
	8.	2D Texture Light Maps. 3d Texture Light Maps.	2 hours
	9.	Modelling Material Smoothness.	2 hours
	10	Motion Blur.	2 hours
	11.	Planar Reflections and Refraction Using the Stencil Buffer.	2 hours
	12.	Creating Shadows.	2 hours
	13.	Transparency.	2 hours
	14.	The Imaging Subset in OpenGL.	2 hours
		TOTAL	28 hours

Metode de predare / seminarizare	At course: Course, Explication, Conversation, At laboratory: Exercise, Explication, Conversation.
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Stabilirea notei finale (procentaje)	- small programming exercises (N1)	20%
	- two OpenGL projects (one in 2D and one in 3D) (N2)	30%
	- two midterms (N3)	15%+15%
	- comprehensive final examination (N4)	20%

Exam: written examination.

The semester grade (NF) will be based upon assignments issued in class, which might involve some small programming exercises (20%), two OpenGL projects (one in 2D and one in 3D) (30%), two midterms (15% each), and a comprehensive final examination (20%).

- a) small programming exercises (N1) – 20%
- b) two OpenGL projects (one in 2D and one in 3D) (N2) – 30%
- c) two midterms (N3) – 15%+15%
- d) comprehensive final examination (N4) – 20%

Final grade (NF) calculation: $NF=0,2 \times N1+0,3 \times N2+0,3 \times N3+0,2 \times N4$

Condition for obtaining the credits: a minimum grade of 5 for all components (N1, N2, N3, N4).

Cerințe minime pentru nota 5

The student can implement an application using OpenGL.

Cerințe pentru nota 10

The student can implement an high level OpenGL application.

TOTAL ore studiu individual (pe semestru) = 20 hours

References	<ol style="list-style-type: none">1. Baciu, R., Volovici, D., <i>Sisteme de prelucrare grafică</i>, Editura Microinformatica, Cluj-Napoca 1999.2. Baciu, R., <i>Programarea aplicațiilor grafice 3D cu OpenGL</i>, Editura Albastră, Cluj-Napoca, 2005.3. Hearn, Donald, Backer, M. Pauline, <i>Computer Graphics</i>, Prentice-Hall, Inc, Englewood Cliffs, New Jersey, 19864. Foley, J., A. vanDam, Feiner, S.K., Hughes, J.F., <i>Computer Graphics: principles and practice</i>, Addison Wesley Publishing Company, second edition, 1993.5. Neider, J., Davis, T., Woo, M., <i>OpenGL Programming Guide</i>, Addison-Wesley, Menlo Park, 1993.6. OpenGL Architecture Review Board, <i>OpenGL Reference Manual</i>, Addison-Wesley, Menlo Park, 1993.
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Lista materialelor didactice utilizate în procesul de predare:

Powerpoint presentation, written books, CD with practical applications

COURSE CO-ORDINATOR	Grad didactic, titlul, prenume, numele	Semnătura
	Assoc.Prof. Eng. Rodica BACIU, Ph.D.	