HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Computer Graphics				
CODE: CENG430	**SEMESTER:** FALL OR SPRING			
LANGUAGE: ENGLISH	**TYPE:** ELECTIVE			
PRE-REQUISITES: - **CO-REQUISITES:** -	**THEORY**	**PRACTICAL**	**CREDIT**	**ECTS**
WEEKLY HOURS:	3	0	3	5

CONTENT OF THE COURSE:
Hardware and software components of graphics systems. Output and filled-data primitives. Fourier analysis, convolution, sampling, quantization, aliasing. 2D and 3D geometric transformations. Two-dimensional viewing. Three-dimensional viewing: Viewing pipeline, viewing parameters, projections, viewing transformations, clipping. Visible surface detection. Introduction to illumination models and surface rendering.

OBJECTIVE OF THE COURSE:
This course introduces the basic concepts of computer graphics and raster based methods. It also provides the necessary theoretical background for introductory computer graphics and demonstrates the application of computer science to graphics. It also offers an opportunity for students to formulate and implement applications of computer graphics. This course further allows students to develop programming skills in computer graphics by programming assignments.

WEEKLY SCHEDULE	
Week	**Topics**
1	Introduction, images, displays, human vision, and color
2	Geometry in Ray Tracing
3	Shading in Ray Tracing
4	Data Structures for Graphics
5	Modeling Transformations
6	Viewing Transformations
7	Forward Rendering Pipeline (overview, culling, clipping)
8	Forward Rendering Pipeline (rasterization, texture mapping, hidden surface removal)
9	Introduction to GPUs, OpenGL and Unity 3D
10	Vertex and Fragment Shaders
11	Buffers and Textures
12	Curves and Surfaces
13	Animation
14	Review

TEXTBOOK: Peter Shirley and Steve Marschner, "Fundamentals of Computer Graphics", 3rd Edition, A K Peters, 2009, ISBN 978-1568814698.

REFERENCE BOOKS: Donald D. Hearn and M. Pauline Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004, ISBN 978-0130153906.

Hughes, J. F., Van Dam, A., Foley, J. D., & Feiner, S. K. (199). *Computer graphics: principles and practice*. 2nd ed. Addison Wesley.

EVALUATION SYSTEM:		
IN-TERM STUDIES	**QUANTITY**	**PERCENTAGE (%)**
Midterm Exam	1	20
Homework	5	20
Laboratory works	13	20
Quiz	0	0
Final Exam	1	40
TOTAL	20	100
CONTRIBUTION OF INTERM STUDIES TO OVERALL GRADE	19	60
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	40
TOTAL	20	100

COURSE CATEGORY:	**PERCENTAGE (%)**
Mathematics and Basic Sciences	10
Engineering	70
Engineering Design	20
Social Sciences	

TABLE OF ECTS / WORKLOAD:			
Activities	**QUANTITY**	**Duration (Hour)**	**Total Workload**
Course Duration	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Laboratory works	-	-	-
Mid-term	1	2	2
Final examination	1	2	2
Homework	5	3	15
Quiz	0	0	0
Total Work Load			**142**
Total Work Load / 30			**4,73**
ECTS Credit of the Course			**5**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
LO1	3	1	0	1	0	0	0	0	0	0	0
LO2	2	2	0	2	0	0	0	0	0	0	0
LO3	2	3	0	3	0	0	0	0	0	0	0
LO4	2	3	0	3	0	0	0	0	0	0	0
LO5	2	3	0	3	0	0	0	0	0	0	0

LO6	2	3	0	3	0	0	0	0	0	0	0
LO7	2	3	0	3	0	0	0	0	0	0	0
LO8	2	3	0	3	0	0	0	0	0	0	0
LO9	2	3	0	3	0	0	0	0	0	0	0
LO10	2	3	0	3	0	0	0	0	0	0	0
LO11	2	3	0	3	0	0	0	0	0	0	0
	PO: Program Outcomes | LO: Learning Outcomes Values: 0: None | 1: Low | 2: Medium | 3: High										

INSTRUCTOR(S):	Prof. Dr. Veysi İŞLER
FORM PREPARATION DATE:	23.05.2019

LEARNING OUTCOMES OF THE COURSE:	**PROGRAM OUTCOMES:**
LO1: Understand basic properties of images and display devices. **LO2:** Understand the steps involved in generating a 2D image of a 3D virtual scene. **LO3:** Understand and implement the ray tracing algorithm. **LO4:** Understand and implement the mathematical modeling of curves and surfaces. **LO5:** Apply composite modeling, viewing, projection, and viewport transformations. **LO6:** Apply 2D texture images to 3D models. **LO7:** Understand and implement basic lighting and surface shading models. **LO8:** Understand the basics of the programmable forward rendering pipeline. **LO9:** Understand and implement hidden surface removal and shadowing algorithms. **LO10:** Design computer graphics programs using OpenGL and Unity 3D. **LO11:** Understand the basics of computer animation.	**PO1:** Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems. **PO2:** Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose. **PO3:** Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose. **PO4:** Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively. **PO5:** Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions. **PO6:** Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually. **PO7:** Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions. **PO8:** Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself. **PO9:** Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice. **PO10:** Knowledge about business life practices such

	as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development. **PO11:** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.