Course Information

Course Code	5710477
Course Section	1
Course Title	INTRODUCTION TO COMPUTER GRAPHICS
Course Credit	3
Course ECTS	6.0
Course Catalog Description	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.
Prerequisites	No prerequisites
Schedule	Tuesday , 08:40 - 10:30, - Thursday , 11:40 - 12:30, -
Course Website	http://www.ceng.metu.edu.tr/courses/ceng477

Instructor Information

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Course Assistants

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Course Objectives

CENG 477 Introduction to Computer Graphics 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

Course Learning Outcomes

At the end of this course, students will be able to:

- **Understand** basic properties of images and display devices.
- **Understand** the steps involved in generating a 2D image of a 3D virtual scene.
- **Understand and implement** the ray tracing algorithm.
- **Understand and implement** the mathematical modeling of curves and surfaces.
- **Apply** composite modeling**,** viewing, projection, and viewport transformations.
- **Apply** 2D texture images to 3D models.
- **Understand and implement** basic lighting and surface shading models.
- **Understand** the fixed function forward rendering pipeline.
- **Understand** the basics of the programmable forward rendering pipeline.
- **Understand** and **implement** hidden surface removal and shadowing algorithms.
- **Design** computer graphics programs using OpenGL
- **Understand** the basics of computer animation

Program Outcomes Matrix

Undergraduate

		Level of Contribution			
	Program Outcomes	**0**	**1**	**2**	**3**
1	an ability to apply knowledge of mathematics, science, and engineering				X
2	an ability to design and conduct experiments, as well as to analyze and interpret data	X			
3	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability				X
4	an ability to function on multidisciplinary teams	X			
5	an ability to identify, formulate, and solve engineering problems				X
6	an understanding of professional and ethical responsibility	X			
7	an ability to communicate effectively	X			
8	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	X			
9	a recognition of the need for, and an ability to engage in life-long learning	X			
10	a knowledge of contemporary issues	X			
11	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice				X
12	an ability to apply design and development principles in the construction of software systems of varying complexity.				X

0: No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

Instructional Methods

Lecture, recitations, laboratory work

Tentative Weekly Outline

Week	Topic	Relevant Reading	Assignments
1	Introduction, images, displays, human vision, and color	Chapters 1 and 3 from the textbook	
2	Geometry in Ray Tracing **Recitation 1: Math review**	Chapters 2, 4, and 5 from the textbook	
3	Shading in Ray Tracing	Chapter 4 and 13 from the textbook	**HW #1 on Ray Tracing**
4	Data Structures for Graphics	Chapter 12 from the textbook	
5	Modeling Transformations	Chapter 6 from the textbook	
6	Viewing Transformations	Chapter 7 from the textbook	**HW #2 on Ray Tracing with Transformations**
7	Forward Rendering Pipeline (overview, culling, clipping)	Chapter 8 from the textbook	
8	Forward Rendering Pipeline (rasterization, texture mapping, hidden surface removal) **Midterm Exam**	Chapter 8 from the textbook	
9	Introduction to GPUs and OpenGL **Recitation 2: Basic OpenGL Setup**	Chapter 18 from the textbook	**HW3: OpenGL Basics**
10	Vertex and Fragment Shaders	Chapter 10 and 18 from the textbook	
11	Buffers and Textures	Chapter 11 from the textbook	
12	Curves and Surfaces **Recitation 3: OpenGL Shaders**	Chapter 15 from the textbook and Chapter 11 from Foley et al.	**HW4: OpenGL Shaders**
13	Animation	Chapter 17 from the textbook	
14	Recap and Future Directions		

Course Textbook(s)

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

Course Material(s) and Reading(s)

Material(s)

Computers

Reading(s)

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

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

Mike Bailey and Steve Cunningham, "Graphics Shaders", A K Peters, 2009, ISBN 978-1568813349.

Peter Shirley and R. Keith Morley, "Realistic Ray Tracing", 2nd Edition, A K Peters, 2003, ISBN 978-1568814612.

Supplementary Readings / Resources / E-Resources

Resources

http://www.opengl.org

Assessment of Student Learning

Assessment	Dates or deadlines
Closed-book exams	
Programming homeworks	

Course Grading

Deliverable	Grade Points
Programming Assignments (10% each)	40
Midterm Exam	30
Final Exam	30
Total	100

Course Policies

Class Attendance

Attendance is optional but it is strongly encouraged.

Class Participation

Class participation in terms of questions and discussions is strongly encouraged

Late Submission of Assignments

Students can distribute their ~~7~~ 10-day grace period to all homeworks without exceeding 3-day for each homework.

Make up for Exams and Assignments

Makeup for exams is possible only with a valid medical report.

Final Exam Entrance Conditions

None

Class and Laboratory Rules (Eating-Drinking, Use of Mobile Phones and Electronic Devices, Civility, etc.)

Students must conform to standard ethics.

Laboratory Safety Procedures

None

Information for Students with Disabilities

To obtain disability related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the ODTÜ Disability Support Office as soon as possible. If you need any accommodation for this course because of your disabling condition, please contact me. For detailed information, please visit the website of Disability Support Office: http://engelsiz.metu.edu.tr/

Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*