Course Information

Course Code 3550477
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 Students must complete one of the following sets to take this course.

<table>
<thead>
<tr>
<th>Set</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>1</td>
<td>3550213</td>
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</tbody>
</table>

Schedule Not available

Instructor Information

Name/Title Assoc.Prof.Dr. TOLGA CAN
Office Address TBD
Email ctolga@metu.edu.tr
tcantr@gmail.com
Personal Website www.ceng.metu.edu.tr/~tcan
Office Phone
Office Hours Fridays 13:00-14:30

Course Objectives

CNG 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:

1. Understand basic properties of images and display devices.
2. Understand the steps involved in generating a 2D image of a 3D virtual scene.
3. Understand and implement the ray tracing algorithm.
4. Understand and implement the mathematical modeling of curves and surfaces.
5. Apply composite modeling, viewing, projection, and viewport transformations.
6. Apply 2D texture images to 3D models.
7. Understand and implement basic lighting and surface shading models.
8. Understand the fixed function forward rendering pipeline.
9. Understand the basics of the programmable forward rendering pipeline.
10. Understand and implement hidden surface removal and shadowing algorithms.
11. Design computer graphics programs using OpenGL.
### Program Outcomes Matrix

#### Undergraduate

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Level of Contribution</th>
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</thead>
<tbody>
<tr>
<td>1. Employ knowledge of mathematics, science and engineering to formulate solution to real life computing problems</td>
<td>X</td>
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<tr>
<td>2. Design and conduct experiments, as well as analyze, evaluate and interpret data</td>
<td>X</td>
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<tr>
<td>3. Design systems, components, and/or processes by specifying the requirements and determining the realistic constraints such as ethical and environmental</td>
<td>X</td>
</tr>
<tr>
<td>4. Judge professional and ethical principles and integrate them in the working environment</td>
<td>X</td>
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<td>5. Have the ability to communicate effectively</td>
<td>X</td>
</tr>
<tr>
<td>6. Recognize the need for, and an ability to engage in life-long learning</td>
<td>X</td>
</tr>
</tbody>
</table>

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

### Instructional Methods

Lectures. In class programming. Programming assignments.

### Tentative Weekly Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Relevant Reading</th>
<th>Assignments</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, images, displays, and human vision</td>
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<tr>
<td>2</td>
<td>Ray tracing: Ray generation.</td>
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<tr>
<td>3</td>
<td>Ray tracing: ray object intersection, basic illumination model, shadows</td>
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<tr>
<td>4</td>
<td>Forward rendering pipeline overview.</td>
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<td>5</td>
<td>Modeling transformations.</td>
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<tr>
<td>6</td>
<td>Viewing, projection, and viewport transformations.</td>
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<td>7</td>
<td>Curves and surfaces: Natural cubic splines, Hermite curves, Bezier curves and surfaces.</td>
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<td>8</td>
<td>Basic Illumination Model in OpenGL and Surface Rendering Techniques.</td>
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<td>9</td>
<td>Rasterization.</td>
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<tr>
<td>10</td>
<td>Texture mapping.</td>
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<tr>
<td>11</td>
<td>Clipping and culling.</td>
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</table>
Introduction to Programmable Shaders and the GLSL language.

Shadow mapping.

Introduction to Blender and Unity.

Course Textbook(s)

Course Material(s) and Reading(s)

Material(s)
OpenGL Red Book.

Reading(s)

Supplementary Readings / Resources / E-Resources

Readings
OpenGL Red Book.

Resources
www.opengl.org

Assessment of Student Learning

Assessment | Dates or deadlines
--- | ---
Programming assignments |
Midterm Exam |
Final exam |

Course Grading

Deliverable | Grade Points
--- | ---
Programming assignments (3) | 30
Midterm exam | 35
Final exam | 35
Total | 100
Course Policies

Class Attendance
Attendance is strongly advised.

Late Submission of Assignments
Assignments can be submitted with 20 pts per day late submission penalty.

Make up for Exams and Assignments
If you have a medical excuse you may take make-up exams for the midterm and final exams.

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."