

Course Specification Document

Title	Computer Graphics
--------------	-------------------

Credits	5 ECTS
----------------	--------

Aims	This course aims to provide the student with a broad knowledge of the principles of 2D and 3D computer graphics and some standard tools, enabling him to design, implement and program graphical applications and projects.
-------------	---

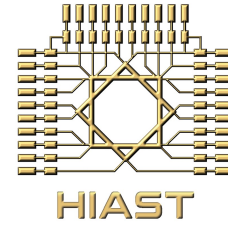
Intended learning outcomes

On successful completion of this course, the student will be able to:

- Understand the concept of computer graphics and matrix-based graphics, based on raster/vector representations and the RGB color model.
- Explore 2D and 3D projection/rendering techniques.
- Understand the basic graphics algorithms, such as Bresenham's line drawing algorithm and clipping algorithms.
- Understand various approaches to modeling and view transformations.
- Identify fundamental concepts in color and lighting.
- Use two-dimensional vector graphics efficiently and easily.
- Design and implement graphic applications by utilizing the OpenGL graphics library and others.

Syllabus

- **General introduction:** Introduction to the application domains of computer graphics, broad definition of computer graphics, differentiation between matrix-based graphics and vector-based graphics, RGB color model, physical and software structures of computer graphics.
- **2D Graphics:** Drawing using the Graphical Unit (GU), 2D projection/clipping using Window Transformation, graphics between software layers in applications and the 2D Graphical Kernel System (GKS) international standardization, basic graphic algorithms (Bresenham's line drawing, Clipping algorithm), introduction to the OpenGL library and the OpenTK library for drawing 2D shapes with color, main formats for graphics files.
- **2D and 3D geometric transformations:** Translation, rotation, scaling, reflection, shear, homogeneous coordinates, composition of transformations, handling user input through the keyboard or mouse.
- **Projections:** Parallel projection, perspective projection.
- **Modeling and view transformations:** Boundary representation (B-Rep) and polyhedral representations, constructive solid geometry (CSG) and Boolean operations on solids, Subdivision, Voxel, Octree.



- **Modeling with curves and surfaces:** Hermite curves, Bezier curves, B-Splines curves.
- **Textures:** Using images, applying textures to shapes.
- **Animation:** Introduction to animation, applying animation to images and shapes.
- **Miscellaneous concepts:** Overview of color models, lighting, general overview of the application domains of geographic information systems (GIS).