**Level**: bachelor

**Course title:** Computer graphics 1 (I161)

**Status**: elective

**ECTS**: 7

**Requirements**: none

**Learning objectives**

Introducing students to the basic principles of 2D computer graphics.

**Learning outcomes**

Students should be able to apply basic, as well as advanced techniques of 2D computer graphics (Java 2D) to real-world problems, to develop and adapt basic algorithms of 2D graphics, and to understand the basic concepts of 3D computer graphics (OpenGL).

**Syllabus**

*Theoretical instruction*

Computer graphics and computer geometry as computer science subjects. Input/output devices. Graphics hardware. Raster graphics. Graphics in Java. Representing points, lines and rectangles. An incremental algorithm for scan-converting lines. Cohen-Sutherland line clipping algorithm. Incremental algorithms for scan-converting circles and ellipses. Ellipse arcs, clipping ellipses. Drawing primitives with attributes (line thickness, line styles etc). Polygons, area and orientation of polygons. Convex polygons. Checking convexity of polygons algorithmically. Orientation of a convex polygon. Drawing filled convex polygons. Convex hull and Graham's algorithm. Intersecting convex polygons and Sutherland-Hodgman algorithm.

*Practical instruction*

Basics of computer graphics support in Java. Iterative and recursive algorithms for drawing poly-lines. Fractals and L-systems. Using images in Java, colour models, and image filtering. Basic concepts of time-based animation. Double buffering algorithm. Morphing animation applied to images and geometric figures. Practical application of the aforementioned topics in the development of advanced user interfaces. Introduction to OpenGL.

| **Weekly teaching load** | | | | Other: 0 |
|---|---|---|---|---|
| Lectures: 2 | Exercises: 1 | Other forms of teaching (computer lab): 2 | Student research: 0 | |