

## SI460 Computer Graphics

At the end of this course you will:

Understand and be able to explain and answer questions about the following:

### Graphics programming

- Event-driven programming paradigm
- Relationship between OpenGL, GLUT, GLU, X11
- OpenGL as a state machine, OpenGL "pipeline"
- Building OpenGL/GLUT programs using make and Makefiles

### Graphics primitives and rendering

- Pixel, texel, convex/concave polygon
- Raster-scan display, framebuffer, raster operations
- Methods of hidden-surface removal (visible surface determination)
- Methods of clipping geometric primitives
- RGB and HSV color models

### Viewing

- Coordinate systems and mappings: world, model, screen, viewport, texture, camera
- Projections: orthographic, perspective

### Illumination and shading

- Phong illumination model
- Gouraud and Phong shading
- Calculating surface normals

### Interaction

- Picking

### Mathematics

- Matrix representation of 2D/3D transformations
- Parametric equation of a line
- Methods of representing orientation (Euler angles, matrix, axis-angle, quaternion)
- Spline curves, piecewise continuous parametric polynomial curves
- Blending functions

Be able to write OpenGL/GLUT/OpenAL code that draws/uses/does the following:

- RGB color with transparency and blending
- Wireframe and filled geometric primitives: points, lines, polygons, text, spline curves
- Lighted, smooth shaded and textured 3D models with projective shadows
- GLU quadric objects, display lists
- Set up 2D orthographic and 3D orthographic and perspective views
- Manipulate matrix stacks to perform coordinate system transformations
- Mouse, menu, keyboard input
- Double-buffered animation
- Read/write pixels from/to the framebuffer, and perform raster operations
- Incorporate simple sound effects using WAV files

Design, implement, build, test and document a multi-file, non-trivial graphics application using OpenGL, GLUT, and 'make'.

Note: This is what you will be graded on.