Welcome to

CS 4/57101  Computer Graphics

Goal:
The goal of this course is to provide an introduction to the theory and practice of computer graphics.
The course will assume a good background in programming in C++ and a background in mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
Components of Course

There will be three components to the course:

- You will gain an understanding of the fundamentals of computer graphics through study of the techniques, algorithms and hardware used in computer graphics.

- You will gain experience in the techniques involved in low level computer graphics programming such as that used to create computer graphics packages (such as OpenGL).

- You will use the industry standard based OpenGL library in several programming projects illustrating the theory and practice of programming computer graphics applications.
Syllabus

- Topics covered will include:
  - Introduction, Motivation, Uses, History
  - Graphics hardware
  - Use of a local designed Simple Graphics Package as a basis for low level programming
  - Use to implement basic 2D Algorithms, Scan conversion, filling, line and pen style, clipping, antialiasing
  - Getting started with OpenGL
  - Input and Interaction in OpenGL
  - Geometrical Transformations in 2D and 3D, homogeneous coordinates, matrix representation, windows and viewports
Syllabus (ctd.)

- Viewing in 3D, projections
- Light, achromatic and chromatic, color models
- and possibly one or more from the following:
  - Visual Realism, rendering techniques for lines and shaded images, dynamics, stereopsis
  - Visible Surface determination, hidden line algorithms, z-buffer
  - Illumination and Shading, light sources, (surface detail, ray tracing, radiosity)
  - Modeling Techniques, curve and surface representation
  - Animation
Text and References

Text:

Alternative Texts:

Additional References:
Assessment:

- Midterm Examination: 30%
- Final Examination: 30%
- Assignments (2 to 6): 40%

Notes:

- Assignments will primarily be programming assignments requiring implementation of applications employing the theory covered in the lectures and books. There will however be some theoretical homeworks and questions as well. Students are reminded that completion of both theory and programming parts of the homework are necessary to achieve a good grade.
Notes (ctd.)

- There will be a penalty for late assignments which may amount to 10% per day.
- The Midterm examination will be between the 7th, and 10th week.
- Assignments are to be completed by the student without assistance from or collaboration with other persons.
- The final examination is scheduled for Tuesday May 7 from 5:45pm to 8:00pm. It may be comprehensive or at least require some knowledge of the material examined in the mid-term.
Additional Requirements

- Before the end of the first week of classes each student should fill out the form at URL
  http://www.cs.kent.edu/~farrell/cg02/form.html

- This syllabus and all subsequent information on the course will be available using the WWW. The home page for the course is:
  http://www.cs.kent.edu/~farrell/cg02/index.html

- All programs should conform to the submission standards given in URL
  http://www.cs.kent.edu/~farrell/cg02/submission.html
Directions in Computer Graphics

- Plotting
- Interactivity
- Real-Time Manipulation
- Image-Realism (Photorealistic rendering)
- Real-Time Rendering
- Scientific Visualization
Computer Graphics - Systems Programming?

Characteristics:
- dynamic environment
  - time sensitive
- interactive environment
  - creator
  - user
  - timing issues
- simulation environment
- visualization environment
Components of Computer Graphics

- **Modeling:**
  - Defining objects in terms of primitives, coordinates and characteristics

- **Storing:**
  - Storing scenes and images in memory and on disk

- **Manipulating:**
  - Changing the shape, position and characteristics of objects
Components of Computer Graphics

- Rendering:
  - applying physically based procedures to generate (photorealistic) images from scenes (using lighting and shading)

- Viewing:
  - displaying images from various viewpoints on various devices