

The final exam will be conducted during the scheduled time of Friday, Dec. 16, 2005 in our regular class, SS-133, from 10:30AM to 12:30PM, plus 20 min. of overtime. Like the other exams, you will be expected to use Hearn and Baker's textbook some details of principles, mathematics and OpenGL. Other notes and class materials are permitted as well.

There will be some "multiple choice" problems in the exam, i.e., you will get full credit for answering say 3 out of 5 problems.

Named Paragraphs, numbered sections and (principles) in Hearn and Baker that the course addressed. The final will cover a few basics (like matrix multiplication, vectors and transformations) from pre-midterm 2 topics and then concentrate on post-midterm 2 topics. The following summarizes the entire course coverage.

- Chapter 1: Familiarity with applications of computer graphics.
- Within Chapter 2: Coordinate Representations. Graphics Functions. Basic OpenGL Syntax. Display Window Management Using GLUT. Within A Complete OpenGL Program, emphasize: (display and other callback functions).

Basic X3D (XML variant of VRML, mentioned in 2-8 will be covered in the last lecture!

Sections: 2-1, 2-2, 2-3, 2-4, 2-5, 2-8, 2-9

- Within Chapter 3: 3-1 Coordinate Reference Frames. (Converting from world to screen coordinates as done in class.) 3-2 Specifying a Two-Dimensional World-Coordinate Reference Frame in OpenGL. 3-3 OpenGL Point Functions. 3-4 OpenGL Line Functions. 3-5 Line-Drawing Algorithms. 3-7 Setting Frame Buffer Values. Within 3-9, (equations for circles). Polygon Tables. 3-16 OpenGL Polygon Fill-Area Functions (including arrays and/or structures for storing your Project 2 model.) 3-20 (Bitmap and outline fonts compared). 3-24 OpenGL Display-Window Reshape Function (how to preserve aspect ratio during resizing).

After Midterm 2, we covered tessellation (3-14), and from (3-15) polygon tables, plane equations, front and back faces, winding number, how the order of vertices determines whether a face is front or back facing,

- Within Chapter 4: 4-1 State Variables. 4-2 Color and Gray Scale. 4-5 Line Attributes. 4-7 OpenGL Point-Attribute Functions. 4-8 OpenGL Line Attribute Functions. 4-9 Fill-Area Attributes (and the formula  $\mathbf{P} = t\mathbf{F} + (1 - t)\mathbf{B}$  for blending).

After Midterm 2, we covered filled areas and color interpolation, and one scan line filling rasterization algorithm. See sections 4-9 and 4-10.

The first project also included 4-15 and 4-16 material.

- All Chapter 5 except 5-6 and 5-7. Please study one fact about quaternions: They are better for animating rotations than matrices.

Forms and manipulation of equations for lines and circles as done in class.

- Chapter 6: Two dim. viewing as done in class. When should `glViewport()` set the viewport to the window size; and when should it not? Within 6-7, equation (6-13)  
Post midterm 2 includes clipping (Cohen-Sutherland, and Liang-Barsky) Sections: 6-1, 6-2, 6-3, 6-4, 6-4, 6-7, and Sutherland-Hodgeman filled polygon clipping in 6-8.
- Chapter 7 (3D stuff) 7-1, 7-2, 7-3, 7-4, 7-5, (7-7 omitting the math.), 7-8 (mathematical treatment given in class), normalized view volume, 7-10, 7-11.  
Redbook Chapter 3: OpenGL 3D viewing, and hierarchical model implemented with matrix stacks and drawing functions.
- Chapter 8: 8-1, 8-2, 8-3, 8-4, 8-5, 8-6 (up to the teapot), 8-7, 8-8, 8-9, 8-10, 8-11 (as covered in class).  
Introductory coverage of sweeps (8-19), fractals (8-23) with their self-similarity, the algorithmically generated Koch curve, and Barnsley's algorithm for custom fractals.
- Chapter 9: Back faces (9-2), the depth-buffer (9-3) related to normalized view volumes; OpenGL **fragments** versus **pixels**.
- Chapter 10 and Redbook chapters 4 and 5: 10-1, 10-2, 10-3, 10-5, 10-10 (flat, Gourand versus Phong), 10-20 (ref. OpenGL proj 4).  
Parametrizing surfaces (with 2-parameters) is useful for texture mapping.
- Chapter 11: GLUT mouse and keyboard functions in 11-6  
Red Book: Double Buffering and Animation from Chapter 2.
- Chapter 13: Animation using interpolating lines or Bezier splines within Blender.
- Chapter 14: Hierarchical Modelling, local coordinates and modeling transformations 14-3 and Angel's, library reserve of Angel's book, and class material on Angel's Scene Graph.  
Introduction to X3D as outputted from Blender. (last lecture, handout)
- Blender familiarity: A few questions to test basic ideas covered in my tutorials.

Email to be with particular questions for which I can write an answer and/or direct you where to study, before 9:00AM Thursday, 12/15, will be welcomed!