CS 645 * Interactive (Advanced) Computer Graphics * CS 645

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Office Hrs.: MW 10:45-11:45am, 4:15-5:00 pm; TR 5:20pm-5:50pm; and **MOST** Fridays 10:45am-11:45am
Or phone or email for appointment (always verify availability for Friday office hours!)

Fall 2004 Meeting Times: TR 12:45-2:05pm, TH N 326

Course Objectives: Study computer graphics topics, especially **3D graphics algorithms** useful for interactive graphics. The topics include 3D viewing and projections, 3D animation, modeling and representation of curves and surfaces, hidden surface removal, and methods for shading and illumination. Course will also likely include an introduction to hierarchical graphical programming. Most (perhaps all) projects will be done using OpenGL.

Prerequisites: CS 545 (or equivalent introductory graphics class). Proficiency in C or C++ programming and enough understanding of linux to run and test a program.

Text: *3D Computer Graphics,* **Third Edition**, by Alan Watt, Addison-Wesley: New York, 2000.

Supplemental Reference : *OpenGL Programming Guide, Fourth Edition* (Second or Third Edition also acceptable), by D. Shreiner, M. Woo, J. Neider, and T. Davis, Addison-Wesley: New York, 2004.

Grading Break-down: The course grade will be broken down as follows.

Activity	**Total Points**
Mid-term Examinations (2)	200 pts. total
Projects (5)	180 pts. total
Final Exam	120 pts.
Homeworks, Reports, and Participation	45 pts.
Grand Total	545 pts.

The grading scale[1] will not be stricter than:

495 points	for a 4.0.
445 points	for a 3.0.
390 points	for a 2.0.
355 points	for a 1.0.

[1]Please note that "plus" and "minus" grades will be used.

Grading Notes

Changes

The instructor reserves the right to make changes to the grading break-down, including the addition of unannounced quizzes. You will be informed of any changes.

Exams

There will be two mid-term examinations, each worth 100 points. These exams are tentatively scheduled for Thursday, **September 30** and Thursday, **November 4**. The comprehensive final is Tuesday, **December 14**, from 11:30 to 2:00 pm.

Homeworks

There will be a few homeworks and/or short reports in the class, although more homework will be assigned if necessary. All homeworks are due at the start of the class on the due date. Homeworks are to represent your own work; without prior clearance from the instructor, all forms of oral, written, electronic, etc., collaboration are prohibited. At least one homework is likely to involve reading and analyzing a paper from the graphics literature. One homework is currently scheduled to be due during the last week of class.

Projects

There will be 5 projects in this course[2]. At least 4 of the projects will be programming assignments. For the other one, you have the option of doing another programming assignment or of writing a research paper on a topic that receives instructor approval. Projects will, in general, take 12-40 hours each, depending on your proficiency, efficiency, and any extra features you attempt.

Program development is possible via remote Internet access. Further, some lab PCs are dual-boot machines, and can be booted under Linux with X-windows. A few of these machines have OpenGL and GLUT. All of these machines as well as remote boxes running Unix or supporting X windows (e.g., via Exceed) can also telnet to one of the lab workstations (e.g., havoc) and receive X windows output by setting the X display variable to the local machine.

Final source code for programs should be submitted electronically, and a printed listing must be handed in. The programs are expected to contain a reasonable amount of documentation (including acceptable structure, variable names, etc.). The submitted programs must compile and execute correctly on the Linux boxes on the north side of the Laser Lab. **Programs will be tested on the Department's linux boxes under OpenGL and must work correctly in that environment to receive full credit. Please test your program on the machines that I will test them on!** Additional details will be included in the first assignment's instructions.

Programs are to be written in C/C++ and should use the graphics library specified on the programming assignment. You should be able to use either Mesa (a free OpenGL mimic[3]) or native OpenGL and experience a similar result. We will couple OpenGL with GLUT (and possibly GLUI) for all programming assignments. We might use VRML for one project.

Paper Option

If you choose to write a paper for one of the projects for which the paper option is available, the paper is expected to be 6-11 pages in length, with standard margins, fonts, and spacing. More details about the paper option will be provided later.

[2] One project will be due in the last two weeks of the term.

[3] Mesa programs will generally run fine on linux, Mac, and Windows.

Deadlines, Late Work, and Absence Policy

You are responsible for all material covered in the lecture, so it is in your best interest to attend each class. Also, effective, constructive participation in the class will be considered for part of your grade. **No** late work will be accepted. currently scheduled to (with documentation acceptable to the instructor) or one week's prior notice required for *consideration* of exam make-up (consideration will be made on a case-by-case basis). All program listings, papers, homework, and report(s) are due at or before the start of the class on the due date. If you will be absent on a due date, please arrange to submit your work early in person or by proxy. Electronic submissions of program sources must be received by instructor by 12:40 pm on their due date.

Misc. Items

Contact Notes: Please check your email regularly. Sometimes class updates are distributed by email. Also, I try to check my email regularly; please feel free to contact me with questions via email.

Library References: *Computational Geometry for Design and Manufacture*, by Faux and Pratt.

Principles of Interactive Computer Graphics by W. Newman and R. Sproull.

Academic Honesty: The University policy on academic honesty is quite strict. This policy is discussed in the Code of Student Conduct. The instructor's academic honesty policy is very strict; instances of academic dishonesty will be penalized, ordinarily by failure of at least the assignment, if not the course (in addition to any University penalties). *All work submitted must be the student's own work!*

It is unprofessional and dishonest to submit someone else's work as your own. Do not use other's code in your program (or use any type of resource not listed on this syllabus) without first receiving instructor approval. Projects are NOT group efforts. You should not seek or use assistance from anyone or any thing on the projects without first getting approval from the instructor for the type of assistance contemplated.

Tentative Class Outline: The intended schedule of the class is indicated below. This list is subject to change.

Topic	Week	Reading Assignments
Matrix Alg. (refresher) and Intro. to Open GL	First Week	Ch. 1.1-1.3, OpenGL book/guide
Homogeneous 3D Transf., Proj., & Viewing	Second Week	Ch. 1.1-1.3, 5
Clipping, Shading, and Illum. (Rendering)	3rd and 4th Week	Ch. 6.1-6.3
Hidden Surf. Removal	5th Week	Ch. 6.5-6.6
Textures	6th Week	Ch. 8
Shadows	7th Week	Ch. 9
Global Illum. - Ray Tracing and Radiosity	8th - 10th Weeks	Ch. 10-12
Scene Modeling	11th Week	Foley Ch. 7 (?) or VRML Handout?
Modeling Techniques and Rep.s	12th Week	Ch. 2
Curve and Surface Fitting and Modeling	13th and 14th Week	Ch. 3
Local Reflection Models	15th and 16th Week	Ch. 7

If time:

Volumetric Rendering / Volumetric Visualization (Ch. 13); Anti-Aliasing (Ch. 14); Image-Based Rendering (Ch. 16)