

# CS 646 Computer Geometry Modeling

UAH Computer Science

Summer 2005 Syllabus

**Instructor:** Dr. Tim Newman

email: tnewman@cs.uah.edu  
TH N364  
Phone: 824-6619  
Fax: 824-6239

Office Hrs.: T, R 4:45-5:00pm  
T, R 1:00-1:30pm  
W 2:30-4:00pm  
or by **appt.**

**Meeting Times:** TR 2:45-4:45pm, TH N 306

**Course Objectives:** Study representation schemes for curves, surfaces, solids, and other spatial data and the impact of representation on graphics algorithms. Topics include spline curves and surfaces, quadric surfaces, space occupancy approaches, and constructive approaches. Most projects will be done using OpenGL. Scene-graph approaches will also be considered.

**Text:** *Geometric Modeling, Second Edition*, by Michael Mortenson, John Wiley: New York, 1997.

**Recommended Supplementary Text:** *OpenGL Programming Guide, Second Edition* (any later edition also acceptable), by M. Woo, J. Neider, and T. Davis, Addison-Wesley: New York.

**Supplemental Reference (at library):** *Computational Geometry for Design and Manufacture*, by Faux and Pratt.

**Course Prerequisites:** CS 545 (or equivalent class with instructor approval). Proficiency in C/C++ programming and at least minimal understanding of Unix/Linux.

**Grading:** The final grade will be composed of the following weights. The instructor reserves the right to make changes to this system, including the addition of an unannounced quiz.

Activity	Total Points
Mid-term Examination	100 pts.
Final Exam	125 pts.
Projects (3)	100 pts. (total)
Homeworks and Participation	35 pts.
<b>Grand Total</b>	<b>360 pts.</b>

The grading scale will not be stricter than:

325 points for a 4.0.  
290 points for a 3.0.  
255 points for a 2.0.  
235 points for a 1.0.

Please note that the instructor intends to utilize the “plus” and “minus” letter grading system.

**Office and 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. Sometimes I am able to accommodate drop-in students (i.e., those without an appointment) outside of office hours. But, please do **not** consider dropping in if my door is closed. The only time you should attempt to disturb me in person when my door is closed is if it's during the posted office hours. Also, I work on my research and with my graduate research advisees on Fridays; it's unlikely that I'll be available for drop-ins on Fridays, although phone or email are always fine. Thanks!

**Exams:** There will be one mid-term examination, worth 100 points. It is tentatively scheduled for Tuesday, **June 28**. The mid-term will **NOT** consume the entire class period that day. The comprehensive final is Thursday, **August 4**, from 3:00 to 5:30 pm.

**Projects:** There will be 3 projects in this course, and the last project will be due during the last two weeks of class. Projects will usually take 10 to 40 hours each, depending on your proficiency, efficiency, and the amount of extra features you attempt. The last assignment might be completed in small teams of 2 to 3 members each.

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 secure shell (ssh) 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<sup>1</sup>) 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.

**Homeworks:** A few homeworks will be assigned throughout the term. Homeworks are due at the beginning of the class on the due date.

**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 participation in the class will be considered for part of your grade. If you will need to miss a class, the instructor should be notified in advance, if possible. **No** late work will be accepted. Crisis (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, please arrange to submit your work early in person or by proxy. Electronic submissions of program sources must be received by instructor by 2:40 pm on their due date.

**Withdrawing:** The last date to withdraw from UAH courses is July 19.

---

<sup>1</sup>Mesa programs will generally run fine on linux, Mac, and Windows.

**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 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. Please, 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. Unless billed as a group project, no project is to be a group effort. That means that 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	Study Area
Open GL overview, Matrices, and 3D Viewing	First Class	App. A, B, C; OpenGL book/guide
B-reps I: Wireframes, Polyhedra, Basic Curves	First Week	Chs. 2,3
B-reps I: Hermite, Bezier, B-Spline, and Other Curves	First & Second Weeks	Chs. 3-5
B-reps II: Surfaces - Implicit (incl. Quadric) Surf.s	Second & Third Weeks	Ch. 6
B-reps II: Bicubic Spline Surf.s	Third & Fourth Weeks	Chs. 7-9
B-reps III: Impact, Case Studies, and Putting it together	Fourth & Fifth Weeks	Ch. 11.1, 11.2, 11.4, and Readings
Scene-Graphs and VRML	Fifth & Sixth Weeks	Reading
Solids and Space Occupancy I & II	Sixth Week	Ch. 10, 11.5
Case Studies, Extensions, and Other Spatial Data Structures	Seventh Week	Readings
Space Occupancy III: Volume Elements/Graphics	Seventh & Eighth Weeks	Readings
Interlude: Ray Tracing	Eighth Weeks	Readings
Constructive Approaches	Ninth Week	Ch. 11.2, 11.3
Features, Model Conversion	Ninth Week	Readings