COSC 5327 INTRODUCTION TO COMPUTER GRAPHICS

Instructor: Dr. Scott A. King
Phone: (361) 825-5877
Email: Scott.King @ TAMUCC.edu
Office: Center for Instruction 327
Fax: (361) 825-2795

Fall 2011
Office Hours: TBD

Course website: http://sci.tamucc.edu/~sking/Courses
/COSC4328/ will have the most up-to-date information as well as slides, notes, examples, etc. Please visit it often.

Course Description and Purpose

This graduate course provides students with a foundation in basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics using the OpenGL API. Topics include: graphics hardware, rendering, perspective, lighting, and geometry.

This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience using a graphics application programming interface (OpenGL) by completing several programming projects.

This course counts as an elective in the Scientific Computing and Visualization concentration track.

Prerequisites

1. Graduate Student in Computer Science Standing. Students who are not fully admitted into the MS Computer Science program can take this course if they have met the program requirements of coursework in Data Structures and Calculus.
2. Good programming skills in C or C++.
3. This class will teach algorithms, not programming in C.
4. Linear Algebra is recommended.

Student Learning Outcomes

At the end of this course students should:

- Have a basic understanding of the core concepts of computer graphics.
- Be capable of using OpenGL to create interactive computer graphics.
- Understand a typical graphics pipeline.
- Have made pictures with their computer.

Format

This course will be a mixture of lectures, discussions, and demonstrations. The student is expected to actively participate in all class activities. The student is also expected to do outside work on assignments and to complete several pieces of software.

Text and References

The following books might also be useful:

- Foley and Van Dam, *Fundamentals of Interactive Computer Graphics*
- Moller and Haines, *Real-time Rendering*, AK Peters

Course Outline

- Introduction: History of computer graphics, graphics architectures and software, imaging: pinhole camera, human vision, synthetic camera, modeling vs rendering
- OpenGL: architecture, displaying simple two-dimensional geometric objects, positioning systems, working in a windowed environment
- Color: Color perception, color models (RGB, CMY, HLS), color transformations. Color in OpenGL. RGB and Indexed color.
- Input: working in a network environment, client-server computing; input measure, event, sample and request input, using callbacks, picking.
- Geometric transformations: affine transformations (translation, rotation, scaling, shear), homogeneous coordinates, concatenation, current transformation and matrix stacks.
- Three dimensional graphics: classical three dimensional viewing, specifying views, affine transformation in 3D, projective transformations.
- Ray Tracing.
- Shading: illumination and surface modeling, Phong shading model, polygon shading.
- Rasterization: line drawing via Bresenham's algorithm, clipping, polygonal fill, BitBlt. Introduction to hidden surface removal (z buffer).
- Discrete Techniques: buffers, bitblt, reading and writing bitmaps and pixelmaps, texture mapping, compositing.
- Advanced Topics.

Grading Plan

The majority of your grade will come from programming assignments. There will be several projects using OpenGL. You will also have a larger project to create a ray tracer. There will be a midterm exam and a final exam. Programming assignments are open-ended and the student can earn extra points for them. These extra points can be used instead of any grade earned on the final exam. In addition, you will write a short paper on a recent advancement in computer graphics.

<table>
<thead>
<tr>
<th>Grading Component</th>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>20%</td>
<td>90% A</td>
</tr>
<tr>
<td>Final</td>
<td>25%</td>
<td>80% B</td>
</tr>
<tr>
<td>Assignments</td>
<td>45%</td>
<td>70% C</td>
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<tr>
<td>Paper</td>
<td>5%</td>
<td>60% D</td>
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<tr>
<td>Class Participation</td>
<td>5%</td>
<td>50% F</td>
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Exams

- Midterm, Tuesday Nov 22, regular class time
- Final (Demos), Tuesday Dec 13, 2008 8:00AM-10:45AM
Assignments

There will be 8 programming assignments and one paper scheduled as follows (subject to change)

- Assignment 1, due midnight Thursday 15 September
- Assignment 2, due midnight Thursday 29 September
- Assignment 3, due midnight Thursday 13 October
- Assignment 4, due midnight Thursday 20 October
- Assignment 5, due midnight Thursday 27 October
- Assignment 6, due midnight Tuesday 15 November
- Assignment 7, due midnight Tuesday 29 November
- Assignment 8, due 11:00AM Tuesday 13 December (at final)
- Paper, due Tuesday December 6 at the start of class.

Course Policies

- No makeup exam without adequate doctor's excuse explaining your absence. Makeup exams will not be the same exam. If for any reason you have a conflict you must see me as soon as you know about the conflict!
- Incompletes only with documented reasons in accordance with the university policy.
- Late assignments will be marked off at a rate of: 10% for 1 day, 25% for 2 days, 60% for 3 days, 100% thereafter.
- All work must be your own, group work is CHEATING, and all group members will receive a zero.
- Unless otherwise noted, the due time will be 11:59:59PM, 12:00:01AM is 10% off.
- Turn off cell phones and pagers before class.

Classroom/professional behavior

Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor's ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

Disabilities Accommodations: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

Academic Advising: The College of Science and Technology requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. The College's Academic Advising Center is located in Faculty Center 178, and can be reached at 825-6094.

Grade Appeals. As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at http://www.tamucc.edu/provost/university_rules/index.html. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.