**CSC – CPE 476: Real-time 3D Computer Graphics Software Systems**
**Syllabus**

**Professor:** Zoë Wood
**Office**: Building 14, room 209
**Phone:** 756-5540
**office hours**: T&Th 11-12 (W 2-3 online)
**email**: zwood@csc.calpoly.edu
**Schedule**: Lecture T/TH 12:10-1:30 Lab 1:40-3:00pm
**Location:** lecture: 192-331 lab: 14-303

**General:** Welcome to 3D gaming. This course will teach you *some* of the important computer graphics principals of 3D games. This course is primarily focused on the graphics components of interactive 3D games/worlds. We will cover advanced real-time graphics techniques mostly in the context of games. **This course requires substantial math and programming skills.** Experience with C or C++ will be essential and experience with linear algebra will be very helpful. We will be using OpenGL for our graphics APIs, along with C++ to create computer graphics games throughout the quarter. The labs will be held in 303 but you are welcome to develop your programs under alternative operating systems as long as the final programs can be demonstrated and run on multiple machines for the final game play demo.

**Assignments:**

- 2 mid-term exams (20% of final grade)
- 3 lab/programming exercises (12% of final grade – 3-4% each)
  - OpenGL & C++ application
- One larger team final programming project (60% of final grade)
  - of your team's choice (again using OpenGL and C++)
  - project must be approved by the instructor (see final project proposal & rubric)
  - teams will be 4-8 people – see instructor for exceptions
  - all teams must meet in quarter deadlines (see syllabus for tentative deadlines)
- Final game play assessment (5% of final grade)
  - Classes assessment of final programming project (2% of final grade)
  - Teams assessment of members (3% of final grade)
- Participation (3% of final grade)
  - attend class/ talk in class or office hours interaction

Please see the program description for deadline details. There is a strict late policy for all assignments – **no late programs/project demos will be accepted.** You do get 1 *free* day, which can be applied to any of the lab/programming assignments. You do not need to explain why you are using the day, just make it clear you are using them for any late assignments. Free days ***are not*** applicable to team final projects.

**Text:** "Real-time rendering" (2nd Edition) Tomas Akenine-Moller and Eric Hanes (required)

Recommended: Any good OpenGL reference, (e.g. "OpenGL: A primer" by Edward Angel or "OpenGL: programming guide" by OpenGL ARB)

"Making Comics" and "Understanding Comics" by Scott McCloud

**Honesty:** Do not take unfair advantage of your classmates. Plagiarism, cheating, and other forms of academic dishonesty will be reported and can have very serious consequences for your academic career. You will be failed from this class and a letter will be put in your file with Cal Poly Judicial Affairs if you cheat. All exams and quizzes are individual efforts. Labs and programming assignments will be specified as either individual or pair/team assignments.

The following schedule for the lectures and assignments may change and is provided to give you a rough outline of the topics we will cover and the timings of your final project reviews. Note that the pairing of reading with topics will likely not change and you are strongly encouraged to use the book as a resource! In other words read the related chapters!

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| **Week 1** | 3/31/09 | ***Academic holiday*** | |
| | 4/2/09 | Introduction – Games & Design | |
| | **Read** | *Chpt. 2 from RTR (&Chpt. 3 if necessary)* | |
| **Week 2** | 4/7/09 | Graphics pipeline review | |
| | **Read** | *Chpt. 2 from RTR (&Chpt. 3 if necessary)* | **Marketplace to form tea** |
| | 4/9/09 | Geometry in games – characters, terrain & acceleration | **Project Proposal Due** |
| | **Read** | *Chpt. 9 & 11 in RTR* | |
| **Week 3** | 4/14/09 | Performance – spatial data structures | **Lab 1 due** |
| | **Read** | *Chpt. 9 from RTR* | |
| | 4/16/09 | Performance – view frustum culling | |
| | **Read** | *Chpt. 9 from RTR* | |
| **Week 4** | 4/21/09 | Geometry in games – level of detail I | |
| | **Read** | *Chpt. 11 in RTR* | |
| | 4/23/09 | Geometry in games – level of detail II | **Lab 2 due** |
| | **Read** | *Chpt. 11 in RTR* | |
| **Week 5** | 4/28/09 | Performance and Geometry review | |
| | **Read** | *Chpt. 2 & 9 & 11 from RTR* | |
| | 4/30/09 | **Midterm 1** | **25% Final project** |
| | **Read** | *Your notes from lecture* | |
| **Week 6** | 5/5/09 | Lighting review & texture review | |
| | **Read** | *Chpt. 4.1-4.3 in RTR & ppt slides* | |

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| | 5/7/09 | Texturing methods (e.g. light mapping) | |
| | **Read** | *Chpt. 5.4-5.7 in RTR* | |
| **Week 7** | 5/12/09 | Texturing methods (environment & bump mapping) | |
| | **Read** | *Chpt. 5.4-5.7 in RTR* | |
| | 5/14/09 | Lighting in games– vertex & pixel shaders | **50% Final project** |
| | **Read** | *Chpt. 6 in RTR* | |
| **Week 8** | 5/19/09 | Lighting in games– vertex & pixel shaders | |
| | **Read** | *Chpt. 6 in RTR* | |
| | 5/21/09 | Lighting in games - shadows | |
| | **Read** | *Chpt. 6.12 in RTR* | **Lab 3 due** |
| **Week 9** | 5/26/09 | Effects in games – particle systems, billboarding | |
| | **Read** | *Chpt. 8 from RTR* | |
| | 5/28/09 | Performance – alternative rendering | |
| | **Read** | *Chpt. 9 from RTR* | **75% Final project** |
| **Week 10** | 6/2/09 | Performance – pipeline optimization | |
| | **Read** | *Chpt. 10 from RTR* | |
| | **6/4/09** | **Midterm 2** | |
| | **Read** | *Your notes from lecture* | **90% Final project** |
| **Final** | 6/9/09 | **Tuesday 3:10-7pm** | **100% Final project** |