CSE 473: Fundamentals of 3D Game Development

Fall Term 2013

1 Course Information

This course will study the processes, algorithms, and mathematics necessary to create 3D computer games. The goal of this class is to develop the skills necessary for a professional programmer in a video game development team. We will learn how to manage and render 3D images and animations and how to develop the interactive components that make computer games work.

Objective: Students completing this course are expected to be able to:

- Develop a simple computer game from a specification.
- Understand and create content processing components.
- Understand the components of the game loop and the update and drawing phases.
- Understand and be able to apply and analysis geometric transformations.

Instructor: Charles B. Owen
Office: 1138 Engineering Building
Phone: 353-6488
Office Hours: 1:00-2:00 Mon, Wed, Thur and by appointment.
I have an open-door policy. Feel free to contact me at any time.
cbowen@cse.msu.edu

TA: Xiaojun Wang
wxj995@gmail.com

Schedule: M/W 4:30-5:50am in 1145 Engineering Building

Textbooks: Learning XNA 4.0: Game Development for the PC, Xbox 360, and Windows Phone 7, 2010, Aaron Reed, O'Reilly Media, ISBN 1449394620.

WWW: Information about the class will be posted at: http://www.cse.msu.edu/~cse473.

Computing: This course will utilize the XNA game environment. You will need access to a Windows-based computer. The computer labs are configured to use XNA. Details about all required software are on the class web site. The course software is available to students at no charge.

If you are using the computer labs, you need a set of earphones, since the machines in the lab do not have speakers.

Prerequisites: CSE 331 or CSE 320 and CALC III

Angel: This class will be utilizing angel, the online course management system. This is in addition to the regular class web site, which I will also use. http://angel.msu.edu.

Facebook: A facebook group will be used in support of this and other classes taught by Dr. Owen. A link to the group is on the class home page.

Privacy: Electronic conversation via email, bulletin boards, or any of the angel features, is different from verbal communication because it retains the identity of the participant. In this course, all participants will have access to a list of names and e-mail addresses of
other course participants. Participants in the course will be able to send bulk e-mail to all other participants.

It is inappropriate to use the email features of this course to send bulk e-mail to all enrolled in the class, unless this type of activity is for a specific educational objective, e.g., to facilitate collaborative learning within the class. All use of the e-mail function within Blackboard is governed by the "Good Citizenship in Cyberspace" section contained in MSU's Acceptable Use policy (http://www.msu.edu/unit/complab/policies.html and http://www.cse.msu.edu/facility/policy.html)

Exams: There will be 3-4 online exams. These exams are multiple-choice or numeric answers and the number of tries is unlimited. Each exam must be completed by a specified date. You must take these exams individually.

There will be one in-class examination.

Notice: This course will not have a final. We will, however, meet Tuesday, December 10, 2013, the scheduled day of the final exam from 5:45-7:45pm for evaluation of final projects. Attendance will be required.

Toe-Tippers: Many class sessions will include a handout referred to as a “toe-tipper”. This assignment will be completed during the lecture period. Notice: toe-tippers are to be done ONLY in class and cannot be made up! If you miss class, you miss it. The two lowest-score toe-tippers are discarded in the grading process. This is provided to allow for some legitimate missing of classes. If you must miss more than two classes for university excused absences, toe-tippers beyond the first two can be made up.

You must bring to class a red ink pen. Many of the Toe-Tippers will be collaboratively executed and graded in class.

Step Assignments: Many weeks there will be a smaller programming assignment that must be completed during that week. All step assignments are due when indicated on the class home page. Some step assignments will include questions that must be answered as well as programming assignment steps.

Step Assignments Completion Rule: If you fail to turn in any step assignment, that assignment will be assigned a grade of negative 100%.

Programming Assignments: 3 programming assignments will be assigned during the course of the term. The grades for these assignments may also be reflected in lab assignment grades. Projects 1 and 3 will be a group project.

Grading: In-class examination: 15%  
Online quizzes: 10%  
Step assignments: 30%  
Project 1: 10%  
Project 2: 15%  
Project 3: 10%  
Toe-tippers: 10%

Final grades will be based on this scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>90%+</td>
</tr>
</tbody>
</table>
Attendance: You are expected to attend all class sessions. Failure to attend a class may be reflected in your toe-tipper scores.

Extra credit: There may be limited opportunities for extra credit. I do also make alternative incentives available for exceptional performance and competitive success. I also have on occasion assigned optional loss abatement questions.

Academic Honesty: Article 2.3.3 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the College of Engineering adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide and/or the MSU Web site: www.msu.edu.) Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the http://www.allmsu.com web site to complete any course work in CSE 473. Students who violate MSU rules may receive a penalty grade, including--but not limited to--a failing grade on the assignment or in the course. Contact your instructor if you are unsure about the appropriateness of your course work. (See also http://www.msu.edu/unit/ombud/honestylinks.html)

That’s the university policy. My specific policies are as follows: **You may discuss individual assignments with other students, but the assignment must be entirely your own work.** Plagiarism just makes me mad! All work turned in must be your own. If you borrow or adapt software from a textbook or from source code that is obviously public, you must treat this as a quotation or paraphrase, acknowledging the source in the heading or the program module.

You may discuss assignments in general terms with your classmates, the course staff, or the instructor, but you are not permitted to receive solutions from others or to read or copy part or all of another person’s solution to a problem.

Disabilities: Students with disabilities should contact the Resource Center for Persons with Disabilities to establish reasonable accommodations. For an appointment with a disability specialist, call 353-9642 (voice), 355-1293 (TTY), or visit MyProfile.rcpd.msu.edu.

Commercialization: Commercialization of lecture notes and university-provided course materials is not permitted in this course.

Religious Holidays: You may make up course work missed to observe a major religious holiday only if you make arrangements in advance with the instructor.

Required Activities: To make up course work missed to participate in a required activity for another course or a university-sanctioned event, you must provide the instructor with adequate advanced notice and a written authorization from the faculty member of the other course or from a university administrator.
Commercialization: Commercialization of lecture notes and university-provided course materials is prohibited in this course.

Attendance: Students whose names do not appear on the official class list for this course may not attend this class.

Internet: Some professional journals will not consider a submission for publication if the article has appeared on the Internet. Please notify your instructor in writing if you do not want your course papers posted to the course Web site.

Disruptive Behavior: Article 2.3.5 of the Academic Freedom Report (AFR) for students at Michigan State University states that "The student's behavior in the classroom shall be conducive to the teaching and learning process for all concerned." Article 2.3.10 of the AFR states that "The student has a right to scholarly relationships with faculty based on mutual trust and civility." General Student Regulation 5.02 states that "no student shall . . . interfere with the functions and services of the University (for example, but not limited to, classes . . .) such that the function or service is obstructed or disrupted. Students whose conduct adversely affects the learning environment in this classroom may be subject to disciplinary action through the Student Faculty Judiciary process.

Course Content (in an approximate order of presentation)

- Introduction to C# and XNA
- 3D geometry and transformations
- Controllers and input
- Animation
- Rotation using matrices, Euler angles, and quaternions
- Keyframe animation
- Collision detection
- Scene graphs
- Transparency and drawing order
- Pixel and vertex shaders and High Level Shading Language (HLSL)
- Effects
- Advanced lighting, shadows, etc.
- Skeletal animation and smooth skin
- Morphs, facial animation, and lip synchronization
- Physics
- Parametric curves
- Culling
- 3D Audio
- Particle systems
- Inverse kinematics
- Game state
- Game AI
- Level of Detail
- Content processing

Notice: I never specify exactly what material will be covered on any particular week and reserve the right to modify the presentation order of materials. This is for your benefit. Course progress will be based on feedback from students, be it though grades or directly. Note, however, that we must cover the course materials, so if we slow in one area, we must accelerate elsewhere.

Important Dates

See the class web site for important dates.
The course schedule is subject to change with appropriate notice.