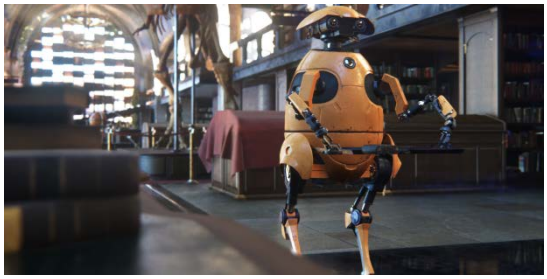
SCHOOL OF COMPUTING, INFORMATICS AND DICISION SYSTEM ENGINEERING (CIDSE)
ARIZONA STATE UNIVERSITY TEMPE, AZ

CPI 411- Graphics for Games

Instructor: Yoshihiro Kobayashi, Ph.D.
Office Room: BYENG M1-39
Office Hours: T TH @ 1 – 3PM
E-mail: ykobaya@asu.edu

Lecture/Lab
Room: BYENG M1-11
Meeting Days: T&TH 10:30-11:45




I. Catalog Description:

Examines real-time rendering of high-quality interactive graphics: Studies advances in graphics hardware and algorithms that make this possible: Examples of techniques and topics include non-photorealistic rendering, occlusion culling, level of detail (LOD), terrain rendering, shadow generation, image-based rendering, and physical simulation. Helps students add graphics-related features to the game architecture developed in CPI 311.

II. Prerequisite:

CPI-311 (or CSE-470/477) with C or better grades

III. General Description

This course is to study coding of real time rendering/shader for games in C# and MonoGame framework. The PC and Visual Studio are required to use any assignments/exercise in this course. By the end of class, it is expected to have the knowledge and skill set to develop shader tools for game engines such as Unity and Unreal. In other words, the students will study how to implement various vertex and pixel shaders for GPU. The topics covered in this course are listed in the next block.

IV. Learning Objectives

Broadly, we will be devoted our time every class to four aspects:

- HLSL (High Level Shader Language),
- Direct3D
- Real Time Rendering Techniques
- Shader Development for Game Engine (Unity)

The followings are the items covered in this course:

- Environment Map,
- Bump & Normal Map,
- Reflection & Refraction,
- Texturing,
- Shadow,
- Particle System

- Ambient Occlusion,
- Physically based rendering,
- Post image processing.

V. Instructional Method

This is a hands-on class. Each student has one PC at class. At class the instructor explains the basic concepts and theory using PowerPoint Slides shown on the projectors, and demonstrates the functions of commands in Visual Studio. The students follow the instructions using their PCs. If they have any question or problem during the instructions, the instructor shows the solutions. For each topic, the students first look at the instructor's demonstration, and repeat the same thing on their PCs. The in-class exercise (Lab) is expected to be finished in the class. A final project is announced at 4th week, and the solutions and problems on their final project are discussed at class through the semester. It may be requested to meet individually for catching up with the topics outside of class. All of the materials using in class are available online at myASU course site. TA is not assigned so that you can stay after the class to ask questions to the instructor.

VI. Attendance Policy

Attendance in this class is mandatory. The attendance is checked in every lecture and lab session. If they attend more than 90 % of sessions, they don't lose any points. Otherwise, the total points are calculated using the following "attendance-rate." Therefore, it is not allowed to send e-mails about sick leave or family emergency to excuse for class-absence. Only if they need a long absence, contact the instructor in person."

More than 90 % of lectures and labs	No grade down (missing 0-3 sessions)
80-90%:	One minor grade down (missing 4-6 session)
70-80%:	One major grade down (missing 7-9 sessions)
Less than 70%	Not pass (missing more than 9 sessions)

We expect the students to maintain atmosphere conducive to teaching and learning in the class. It would be appreciated if all cell phones and pagers were switched off, or to vibrate mode. Active student participation is expected in all in-class discussions.

VII. Textbooks

The Cg Tutorial by Nvidia: This book is available online at
http://http.developer.nvidia.com/CgTutorial/cg_tutorial_chapter01.html

VIII. References

MonoGame: http://www.monogame.net/

IX. Schedule

1	Introduction to the course, Review 3D Game Engine Development		
2	High Level Shader Language (HLSL) Basics **Vertex and Pixel Shader**	**Lab#1**	
3	**DirectX Pipeline** **3D Model**	**Lab#2**	
4	**Texturing**	**Lab#3**	**Assignment#1**
5	**Environment Map** **Skybox**	**Lab#4**	
6	**Reflection**	**Lab#5**	**Assignment#2**
7	**Refraction**	**Lab#6**	
8	**Bump Effect**	**Lab#7**	**Assignment#3**
9	**Shadow**	**Lab#8**	
10	**Particles and Image-based Effects**	**Lab#9**	**Assignment#4**
11	**Tone mapping** **Non Photorealistic Rendering**	**Lab#10**	
12-13	**Shader in Unity**	**Lab#11**	
14	**Workshop for Final Project**		
15	**Demos**	Grade	**Final Project**

X. Assignments

1) Programming Assignments: Students will be assigned 4 game development assignments. The assignments will test students' skill in implementing the concepts discussed in class. These assignments will be implemented in C# with MonoGame/XNA framework.

2) Labs: Every week has one-hour lab session. The students are asked to complete the lab exercise by the end of class and submit the output online.

3) Quizzes: Student will be assigned small quizzes and/or programming exercise at class.

4) Term Project: The culmination of the efforts put by the student in the class assignments. The project will have different deliverables over the time frame of the class

- Midterm Proposal (9^{th} week)
- Final Tool implementation and Demo at class in the 15^{th} week

XI. Field Trips

N/A

XII. Evaluation

1. Assignments:	30%
2. Labs:	30%
3. Quizzes:	10%
4. Term Project:	30%

Late Penalty: No late submissions will be accepted

XIII. Grading Policy

98-100	A+
92 – 100	A
90 – 92	A-
88 - 90	B+
82 – 88	B
80 – 82	B-
70 – 80	C
60 – 70	D
< 60	E

I (Incomplete) grade is not offered in this course

XIV. Disability resource center

Please check the website for ASU's Disability Resource Center (http://www.asu.edu/drc/) for assistance. Students with special needs should contact the center a priori in order to secure assistance.

XV. Integrity Policy:

The highest standards of academic integrity are expected of all students. The failure of any student to meet these standards may result in suspension or expulsion from the University or other sanctions as specified in the University Student Academic Integrity Policy. Violations of academic integrity include, but are not limited to, cheating, fabrication, tampering, plagiarism, or facilitating such activities.

XVI. Expected Workload:

The course is designed to distribute workload pretty evenly over the semester. Students would typically spend **6-9 hours per week** working on homework assignments and projects. Plan your schedule accordingly.