California Sate University, San Bernardino
CSE 520 Advanced Computer Graphics

Instructor : Dr. Tong Lai Yu

Objectives:
This course covers the advanced principles and techniques of Computer Graphics. The course stresses on hands-on experience and programming as well as applications in the industry. Students will learn advanced graphics modeling techniques and apply them to develop industrial-grade applications.

Text: F.S. Hill, Jr. and Stephen M. Kelley, *Computer Graphics Using OpenGL*, Latest Edition, Prentice Hall.

Suggested References:

1. Samuel R. Buss, *3-D Computer Graphics*, Cambridge University Press, 2003.
2. Edward Angel, *Interactive Computer Graphics: A Top-Down Approach with OpenGL*, 3rd Edition, Addison-Wesley, 2002.
3. J.D. Foley and A. Van Dam, *Fundamentals of Interactive Computer Graphics*, 2nd Edition, Addison-Wesley.
4. Foley, vanDam, Feiner, and Hughes, *Computer Graphics: Principles and Practice*, 2nd Edition, Addison-Wesley.
5. D. Hearn, and M.P. BAker, *Computer Graphics, C Version*, 2nd Edition, Prentice Hall, 1996.
6. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner, *OpenGL(R) Programming Guide: The Official Guide to Learning OpenGL, Version 1.2*, 3rd Edition, Addison Wesley, 1999.
7. Dave Shreiner, et al., *OpenGL Programming Guide*, Latest Edition, Addison Wesley, (ISBN 0-321-17348-1).

Office: JB-346 **phone**: (909)-537-5334 **email**: tyu@csusb.edu

Office Hours: Mon: 11 am - 12 pm, 3 - 4 pm, Wed: 3 - 4 pm

Grading :

Quizzes:	25%	Homework:	14%	Final Exam:	30%
Labs:	16%	Project:	15%		

Grade Requirements :

91 - 100 % : A, A-	81 - 90 % : B+, B, B-	
71 - 80 % : C+, C, C-	61 - 70 % : D+, D, D-	$\leq$ 60 % : F

Study Policy:
Students are expected to do the works as assigned, attending all the lectures and studying the text book. They should come to ask the instructor for help or suggestions if they encounter any difficulties or doubts in their work.
Students may work in groups of two on a project, which is to develop a 3D graphics application. Students are encouraged (but not required) to make the application run on the Android mobile platform. The application should involve 3D graphics modeling and animation written with OpenGL Shading Language (glsl). Each group has to decide on a topic by the second week of the class and obtain approval from the instructor, and has to turn in an abstract of about 150 words describing its project by the fourth week. By the 7th week, each group has to make a demo of the first stage of its work. A detailed report of about 5 pages (hard-copy, single-spacing, including figures but excluding source code) is due in the 10th week. In addition, each group must make a presentation and a complete demo and turn in the source code which is ready for compilation and checking in the 10th week. A significant number of points will be taken off for any missed step.

Illness:
A student is responsible for contacting the lecture instructor as soon as possible for providing a satisfactory explanation for missing a scheduled exam or work due to illness or other serious and compelling reasons; documentation evidence is required. Otherwise, missed exams or work will be counted as 0%.

Support for Student with Disabilities:
If you are in need of an accommodation for a disability in order to participate in this class, please contact Services to Students with Disabilities at UH-183, (909)537-5238.

Plagiarism and Cheating:
Students are expected to be familiar with the University's Policy on cheating and Plagiarism. Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified.

Outline of course:

1. Introduction
   Opportunities
   Applications
   Review of OpenGL

2. OpenGL Shading Language (GLSL)
   Programmable Pipelines
   OpenGL Shaders Execution Model
   Overview, Vertex Shaders
   Fragment Shaders

3. GLSL Programs
   Examples, passing shader parameters
   Temperature Shaders, brick Shaders
   Particle system

4. Curves and Surfaces
   Representation of Curves and Surfaces
   Interpolation
   Splines and Bezier Curves
   Evaluators

5. Modeling Shapes with Polygon Mesh
   Mesh Representations
   Revolution of Surfaces
   3ds File Format

6. Parsing External Files
   Blender
   3D Graphics formats
   Collada, libxml2

7. Texture Mapping
   Mapping Methods: Texture mapping
   Bump mapping, Environment mapping
   UV Mapping

8. Casting Shadows
   Simple shadows, photon mapping
   Stencil Buffer, shadow Volume

9. Tools for Raster Display
   Manipulating pixmaps
   Pixmap Operations
   Reading and saving Images