CSCI 5350 - COMPUTER GRAPHICS

CREDIT HOURS: 3
PREREQUISITES: CSCI 3323 or 3341 or 3342; and MATH 1316
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.
CROSS LISTING: CSCI 4345

CATALOG DESCRIPTION

Overview of the hardware, software and techniques used in computer graphics. Graphics primitives, two-dimensional transformations, painting, windowing and clipping. Three-dimensional graphics including hidden lines and surfaces, lighting, texturing, and shading.

PURPOSE OF COURSE

Develop knowledge of terms and concepts, skills in modeling and rendering using a mid-level API (OpenGL), and visual system design and implementation.

NOTE: Students taking CSCI 5350 will be expected to complete additional requirements, including but not limited to special projects, class presentations, relevant research including literature review and current research topics from professional journals, and supplemental evaluation (i.e., additional questions, quizzes, tests). Students taking CSCI 5350 are expected to perform at a higher level than undergraduates taking CSCI 4345. Students should contact the course instructor early in the semester (i.e., before the end of the add/drop period) to determine the specific additional requirements.

EDUCATIONAL OBJECTIVES

The goal of this course is to have students develop a small interactive graphical system based on student interests or minor area of study. The system is to be designed and implemented using software engineering methods, algorithm and data structure techniques, hardware interface and operating system support, graphical library routines, and program performance considerations. Student progress will be evaluated through the successful completion of progressively more advanced graphics laboratory problems, performance on activities, and success of the term project. Specific skills include:

1. Demonstrate knowledge of design and implementation techniques utilizing complex data structures and algorithms for visual based interactive systems including scene graphs.

2. Develop skills in interface design including modeling, input device control, and screen layout (color, composition, presentation).

3. Explore Scene graphs and WEB-based graphics.

4. Explore graphics techniques including drawing, filling, windowing, clipping, curves, coordinate systems, and transformations in two dimensions.

5. Enhance graphics techniques including drawing, filling, windowing, clipping, curves, coordinate systems, transformations, projections, and hidden line and hidden surface techniques for three dimensions.

6. Develop matrix based and parametric formulations for mathematical representation and operations.

7. Enhance visualization skills by exploring texturing, shadowing, ray tracing, and radiosity techniques.

COURSE CALENDAR

This course meets for a minimum of 37.5 lecture contact hours during the semester. Students have significant weekly reading assignments. Students are expected to complete a major project, prepare a class presentation on the project, and 2-3 periodic exams in addition to the final exam. Students are expected to prepare for any class assignments or quizzes over the material covered in class or in the reading material. Successful completion of these activities requires at a minimum six additional hours of outside of classroom work each week.

CONTENT	**Hours**
Overview of Computer Graphics	2
Objectives	
Basic principles	
Introduction to Computer Graphics Hardware	1
Display devices	
Input/output devices	
Design	4
Story Composition	
Art Design	
Games	
OpenGL	6
Design for visual systems (art, story, systems)	3
Scene graphs and WEB-base graphics	3
Graphics Systems and Primitives	2
Library/system support for graphics	
Point plotting	
Straight line drawing	
Curved line drawing	
Two-Dimensional Graphics	6
Mathematical background and Coordinate System	
Transformations (Translation, Scaling, Rotation)	
Animation	
Approaches (segments vs. direct)	
Filling (Painting)	
Windowing	
Clipping	
Three-Dimensional Graphics	12
Coordinate System	
Plotting pints, lines, and surfaces	
Projections	
Perspective views	
Transformations	
Hidden lines and surfaces	
Shading and texture	
Ray tracing and radiosity	
Presentations	6

TOTAL 45

REFERENCES

Angel, E., Schreiner, D., Interactive Computer Graphics: A top-down approach with Shader-Based OpenGL, 6th. Ed. Addison-Wesley, 2011.

Angel, E., OpenGL A Primer, 32rd. Ed. Addison-Wesley, 2007.

Foley, J., van Dam, A., Feiner, S., and Hughes, J., Computer Graphics Principles and Practice, 2nd Ed. in C, Addison Wesley, 1997.

Fernando and Kilgard, The Cg Tutorial, ISBN 0-321-19496-9, Addison-Wesley, 2003.

Fosner, OpenGL: Programming for Windows 95 and Windows NT, Addison-Wesley, 1997.

Hearn, D., Baker, M., Carithers, W., Computer Graphics: with OpenGL, 4th. Ed. Prentice Hall, 2010.

OpenGL Architecture Review Board, Jackie Neider, Tom Davis, Mason Woo, OPENGL Programming Guide, 7th. Ed., Addison-Wesley, 2009.

OpenGL SuperBible, 5th. Ed., Wright, R., Haemel, N., Sellers, G., and Lipchak, B., Waite Group Press, 2010.

Zhang and Liang, Computer Graphics Using Java 2D and 3D, Prentice Hall, 2007.