

CSC 445 - COMPUTER GRAPHICS

CREDIT HOURS: 3
PREREQUISITES: CSC 241; CSC 323 or 342 or 343; and MTH 133
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

An 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: Graduate students taking CSC 445 for graduate credit will be expected to complete additional requirements, including but not limited to special projects, class presentations, relevant research, and supplemental evaluation (i.e., additional questions, quizzes, tests). Graduate students are expected to perform at a higher level than undergraduates. 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 homework, analysis of test responses, and success of the system project.

Upon successful completion of the course, students should be able to:

1. Demonstrate knowledge of design and implementation techniques utilizing complex data structures and algorithms for visual based interactive systems.
2. Demonstrate skills in interface design including modeling, input device control, and screen layout (color, composition, presentation).
3. Identify graphics techniques including drawing, filling, windowing, clipping, curves, coordinate systems, and transformations in two dimensions.
4. Demonstrate graphics techniques including drawing, filling, windowing, clipping, curves, coordinate systems, transformations, projections, and hidden line and hidden surface techniques for three dimensions.
5. Develop matrix based and parametric formulations for mathematical representation and operations.
6. Demonstrate visualization skills such as texturing, shadowing, ray tracing, shading and radiosity techniques.

CONTENT	Hours
Overview of Computer Graphics	2
Objectives	
Basic principles	
Introduction to Computer Graphics Hardware	1
Display devices	
Input/output devices	
OpenGL	4
Graphics Systems and Primitives	5
Library/system support for graphics	
Point plotting	
Straight line drawing	
Curved line drawing	
Two-Dimensional Graphics	10
Mathematical background and Coordinate System	
Transformations (Translation, Scaling, Rotation)	
Animation	
Approaches (segments vs. direct)	
Filling (Painting)	
Windowing	
Clipping	
Three-Dimensional Graphics	20
Coordinate System	
Plotting points, lines, and surfaces	
Projections	
Perspective views	
Transformations	
Hidden lines and surfaces	
Shading and texture	
Ray tracing and radiosity	
Exams (plus final)	3
	TOTAL 45

REFERENCES

Angel, E., Interactive Computer Graphics, 4th Ed., Addison-Wesley, 2006.

Hearn, D., and Baker, M., Computer Graphics With OPENGL, 3rd Ed., Prentice Hall, 2004.

OpenGL Architecture Review Board, OPENGL Reference Manual, 3rd Ed., Addison-Wesley, 2000.

OpenGL Architecture Review Board, Jackie Neider, Tom Davis, Mason Woo, OPENGL Programming
Guide, 3rd Ed., Addison-Wesley, 1999.