Course Assessment Document for CS 351 Computer Graphics

Departmental Outcomes

1. Proficiency in computational thinking
2. Ability to analyze systems at the three levels of computer science: theory, software, and hardware
3. Proficiency in the design and implementation of algorithms using multiple programming languages
4. Ability to apply computational thinking to a diverse set of problems and disciplines
5. Ability to communicate effectively and collaborate with others
6. Ability to adapt to new challenges and computational environments

Course Description

An introduction to computer graphics covering 2-D graphic primitives, clipping graphic objects to boundaries, linear transformations, creating and representing 3-D objects, converting 3-D models into 2-D images, and rendering complex 3-D scenes made of thousands of polygons. Students will build a comprehensive 3-D rendering engine in sequential weekly projects for which they generate images and develop portfolios of their own work.

Prerequisites: CS 251 or permission of instructor. Linear algebra recommended.

Rationale for prerequisites: CS 251 provides background in linear transformations, coordinate frames, and simple viewing pipelines. It also ensures students have sufficient programming experience to pick up a new language quickly and write modular, well-organized programs.

Desired Course Outcomes

A. Students understand and can implement the fundamental concepts of creating and manipulating images.

B. Students understand and can implement the fundamental concepts of rendering, including matrix transformations, shading, and hidden surface removal.

C. Students understand and can implement the fundamental concepts of modeling objects and scenes and hierarchical modeling systems.

D. Students work in a group to design and develop 3D modeling and rendering software.

E. Students present methods, algorithms, results, and designs in an organized and competently written manner.

F. Students write, organize and manage a large software project.

Course Matrix

Outcome	Activities	Method of Assessment	Departmental Outcome
A	Lecture, Textbook Assignments	Exams, lab reports	1, 3, 4
B	Lecture, Textbook Assignments	Exams, Reports	1, 3, 4
C	Lecture, Textbook Assignments	Exams, Reports	1, 3, 4
D	Assignments	Reports and observation in lab	5
E	Assignments	Reports	5
F	Lecture Assignments	Reports, evaluation of code	3, 6

Grade Calibration Matrix

Outcome	Meaning of the grade A
A	The student implements a library of image handling routines, with appropriate error checking, and makes effective use of them throughout the semester.
B	The student completely implements the required rendering system and adds additional functionality to it, such as texture mapping, shadows, or more complex shading models.
C	The student implements the required hierarchical modeling system, creates sophisticated models for the assignments and demonstrates the ability to use hierarchical modeling to create abstract groups and complex scenes.
D	Work is shared evenly between the members of the group. The group is able to effectively divide the task into parts, each group member completes their task on time and is able to integrate it into the project. Group members communicate effectively and work collaboratively.
E	Reports are well written, concise and clear. The reports clearly describe the algorithms used and show images and figures to support the text. The reports are written so that students outside the course could understand the work.
F	The student's code is modular, well-organized, well-commented, and functional. The student makes effective, possibly innovative use of development tools.

Outcome	Meaning of the grade B
A	The student implements a library of functional image handling routines and uses them throughout the semester.
B	The student completely implements the required rendering system.
C	The student implements the required hierarchical modeling system and demonstrates the ability to use hierarchical modeling to create abstract groups and basic scenes.
D	Work is shared between the members of the group. The group is able to divide the task into parts, and each group member completes their task on time and is able to integrate it into the project. Group members communicate sufficiently to integrate their work.
E	Reports are well written and clear. The reports describe some or all of the algorithms used and use some images and figures to support the text. The reports are written so that students taking the course could understand the work.
F	The student's code is modular with a reasonable level of commenting and functional. The student makes use of development tools.

Outcome	Meaning of the grade C
A	The student implements most of a library of image handling routines and uses them throughout the semester.
B	The student implements most of the required rendering system at least through z-buffer rendering.
C	The student implements the required hierarchical modeling system and uses it to build variations of the required basic scenes.
D	Work is unevenly shared between the members of the group, possibly duplicated. The group divides the work between members based on which members are likely to finish the work. Not all group members complete their work on time. Group members communicate, but may have difficulty integrating their work.
E	Reports describe the work, but may take the form of a narrative of what went wrong rather than focusing on the algorithms. The reports describe at least the primary algorithm used in the assignment and include at least the required images. The reports assume the read is familiar with the material.
F	The student's code is modular and mostly functional, but may lack comments. The student uses development tools, but may not make effective or appropriate use of them.

Outcome	Meaning of the grade D
A	The student implements enough of the image handling library to read and write images to a file.
B	The student implements 2D graphics primitives and some portion of the 3D rendering system.
C	The student implements the hierarchical modeling system for 2D objects and builds the required scenes.
D	The student works on their own or is loosely affiliated with another person or group. Group members do not communicate often or effectively and have difficulty integrating code.
E	The student's reports are incomplete or not well written. The report includes the required images but no description of how they were made or their significance. The report contains little information about the algorithms and methods.
F	The student's code is mostly functional, lacks comments, and is not well formatted. The student has a difficult time using development tools.

A student who receives an F does not meet the criteria for a D or any higher grade.