COMPSCI 464: Computer Graphics
3-credit course with 3 lecture hours per week
Course Coordinator: Alark Joshi

Textbook(s) and Supplemental Material


Catalog Description
Mathematics and programming techniques for computer graphics that cover raster graphics, transformations, rendering pipeline, clipping algorithms, lighting models, shading and shadows, texture mapping, antialiasing, ray tracing, non-photorealistic graphics. MATH 275 or MATH 301 recommended.

PREREQ: COMPSCI 342.

Elective

Goals for the Course
Successful students will be expected to:
- learn the basics mathematics required for computer graphics
- understand the fundamentals such as raster graphics, transformations, viewing, clipping algorithms and so on
- implement algorithms for viewing, interaction, lighting and shading as well as ray tracing
- use modern graphics hardware with shaders and understand their use in the graphics pipeline
- familiarize themselves about advanced graphics topics such as non-photorealistic graphics, graphics for games and scientific visualization

Outcomes Addressed
a. an ability to apply knowledge of computing and mathematics appropriate to the discipline
b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
c. an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
d. an ability to function effectively on teams to accomplish a common goal
f. an ability to communicate effectively with a range of audiences
i. an ability to use current techniques, skills, and tools necessary for computing practice
j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices
k. an ability to apply design and development principles in the construction of software systems of varying complexity

Outcomes Assessed: None

Topics Covered
- Introduction to OpenGL
- Math - Vectors, Matrices, determinants, eigen values and vectors
Modeling and Curves
Curves and Surfaces
Transformations
Viewing
Raster Images
Graphics Pipeline
Graphics Hardware and Shaders
Considerations for building interactive graphics applications
Signal Processing
Lighting and Shading
Texture Mapping
Ray Tracing
Clipping
Antialiasing
Color, Vision and Light
Visualization
Non-photorealistic Rendering

**Grading**
A letter grade is assigned to each student at the end of the course based on the numerical scores of these activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Mid Term</td>
<td>15%</td>
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<tr>
<td>Quizzes</td>
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<tr>
<td>Programming Assignments</td>
<td>50%</td>
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<tr>
<td>Final Project</td>
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**Curriculum Category Content (Credits)**

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<thead>
<tr>
<th>Area</th>
<th>Core</th>
<th>Advanced</th>
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<tbody>
<tr>
<td>Algorithms</td>
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<tr>
<td>Software Design</td>
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<td>Computer Architecture</td>
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<td>Data Structures</td>
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<td>Programming Languages</td>
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