

# Course Syllabus

## Lighting and Shading Techniques for Interactive Applications

8:30 A Introduction (Blythe)

8:35 B Lighting Model Basics (Blythe)

1. Diffuse Shading
2. Specular Highlights
3. Ambient and Emissive Lighting
4. Material Properties
5. Multi-pass Lighting
6. Directional and Positional Lights
7. Spot Lights
8. Other BRDFs
9. Global Illumination

9:10 C Shading Computations (Kilgard)

1. Per-vertex and Per-pixel Shading
2. Viewer Position and Lighting
3. Lighting with Texture Maps
  - Multi-texture
4. Light Maps
  - Diffuse
  - Specular
  - Spot Lights
5. Environment Maps
  - Sphere
  - Cube
  - Parabolic
6. Fresnel Effects

**10:00 Break**

**10:15 D Advanced Shading I (Grantham)**

- 1. Bump Mapping**
  - Direct computation
  - Tangent-space
  - Other Methods
- 2. Anisotropic Reflection**
- 3. Reflection and Refraction**
  - Planar Surfaces
  - Curved Surfaces
  - Environment Maps

**11:00 E Advanced Shading II (Kilgard)**

- 1. Shadows**
  - Projection
  - Shadow Volumes
  - Shadow Textures
  - Shadow Maps
  - Soft Shadows using Convolution
- 2. Transparency**
  - Stippling
  - Blending
- 3. Atmospheric Effects**
  - Fog
  - Depth-cuing
  - Haze
  - Non-homogeneous effects

**11:45 F Summary, Questions and Answers (All)**

**12:00 Lunch**

# **Course Syllabus**

## **Advanced Graphics Programming Techniques Using OpenGL**

**8:30 A Introduction (Blythe)**

**8:35 B Visual Simulation (Blythe)**

1. Tiling large Textures
2. Anisotropic Texturing
3. Developing LOD Models for Geometry
4. Billboarding
5. Light Points

**9:20 C CAD I (Nelson)**

1. Constructive Solid Geometry
2. Meshing and Tessellation
3. Improving Numerical Accuracy
4. Silhouettes

**10:00 Break**

**10:15 D Graphics Special Effects (Nelson)**

1. Stencil Dissolves
2. Compositing
3. Antialiasing
4. Motion Blur
5. Depth of Field

**11:00 E Image Processing (McReynolds)**

1. OpenGL Image Processing
2. Accum Buffer Convolution
3. Color Space Operations
4. Image Warping with Textures
5. Texture Synthesis using Noise

**12:00 Lunch**

**1:30 F CAD II (Blythe)**

1. Technical Illustration
2. Occlusion Culling Techniques
3. Depth and Transparency Culling
4. Surface Visualization
5. Picking and Locate-highlight

**2:15 G Scientific Visualization (McReynolds)**

1. Scalar Field Visualization
2. Volume Rendering
3. Vector Field Visualization

**3:00 Break**

**3:15 H Production Graphics (Blythe)**

1. Character Rendering
2. Manipulating Large Images
3. 2D and Line Rendering
4. Tone-reproduction

**4:00 I Simulating Natural Phenomena (Grantham)**

1. Particle Systems
2. Smoke
3. Fire
4. Clouds
5. Water
6. Precipitation and Lightning
7. Fog

**5:00 J Summary, Question and Answers (All)**

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