CTAN 464L Digital Lighting and Rendering 17909D Lec-Lab

2 Units

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Course Description:
This course will survey the tools and techniques to successfully create cinematic lighting and rendering in computer-generated imagery (CGI), using Autodesk Maya 3D animation software. The course will assist the advancing animation or visual effects student with all aspects of CGI rendering, from developing fully digital scenes to integrating CGI with live-action. Traditional direct lighting as well as advanced global illumination techniques used in the visual effects industry will be presented. The course will encompass a series of hands-on workshops, so a prior working knowledge of Maya is essential. Approaches to final compositing is also covered using The Foundry Nuke 6.3.

Prerequisites:
CTAN 462, Visual Effects, or CTAN 452, Introduction to 3D Computer Animation

Course Length:
15 weeks, meeting once a week, three hours each class meeting.

Books Required:

“Advanced Maya Texturing and Lighting” (second edition), Lee Lanier, Sybex, 2008. ($38.00)

Optional Books:

“Digital Lighting and Rendering” (second edition), Jeremy Birn, New Riders 2000. ($35.00)
"Encyclopedia of Visual Effects", Damian Allen and Brian Connor, Peachpit Press 2006. ($40.00)
“Matter of Light and Depth”, Ross Lowell, Lowel-Light, 1992. ($35.00)
“Light-Science and Magic”, Fil Hunter, Focal Press, 2007. ($32.00)
“Lighting for Television and Film”, Gerald Millerson, Focal Press, 1991. ($45.00)
“Maya 6 Killer Tips”, Eric Hanson, New Riders 2004. ($26.00)
“The Art of Maya”, Alias Wavefront, 2000. ($60.00, www.sybex.com)

Optional Educational DVD’s:

“Practical Light and Color”, Jeremy Vickery, The Gnomon Workshop, 2007.
“Digital Sets 2- Lighting and Texturing”, Eric Hanson, The Gnomon Workshop, 2005.
“Digital Sets 3- Rendering and Compositing”, Eric Hanson, The Gnomon Workshop, 2005.

Software Used:

Autodesk Maya 2012, Mental Ray, Pixar RenderMan, Foundry Nuke 6.3, Adobe Photoshop CS5.5

Grading Breakdown:

Participation @10%
Weekly Assignments @30%
Final Project @30%
Final Exam 30%

The final project consists of (3) final still renderings of a supplied 3d model. The work will serve to demonstrate the range of techniques conveyed throughout the class, and allows the student to develop polished, elaborate work for their showreel.

Weekly assignments are due in the following class from when they are assigned.

Final exam is multiple choice in format.

Schedule:

Week 1: ***Introduction to CGI Lighting***

Basics of Cinematic Lighting
Light Properties
Key to Fill Ratio
Establishing Emotion
Establishing Key
Working with Color

Assignment: Light Scene

Required Reading pg. 22-32 Lanier

Week 2: ***Character Lighting***

Review of CG Light Sources
3 Point Setup
Basic Maya Rigs
IPR

In-Class Exercises- Buddha

Assignment: Light Scene- 3 Point, Hi/Lo Key

Required Reading pg. 1-21, 38-51 Lanier

Week 3: ***Direct Lighting Fundamentals 1***

Direct Lighting Technique
Direct Lighting Rigs
Light Linking
Lighting Interiors
Point Arrays
Shadow Mapping
Color Mapping
Incandescence Mapping

In-Class Exercises- Cave Temple

Assignment: Light Scene- Interior of Room

Required Reading pg. 53, 62, 69-99 Lanier

Week 4: *Direct Lighting Fundamentals 2*

Shader Glow Blooms
OptiFX Review
Fogs, Glows, Flares
Lighting Exteriors
Environment Skies
HDR Cheats

In-Class Exercises

Assignment: Light Scene- Lighthouse

Required Reading pg. 54-60 Lanier

Week 5: *Global Illumination Fundamentals*

Global Illumination Terms
Mental Ray Review
HDR Lighting
Physical Sky
Photon Mapping
Hemispherical Sampling
Caustics
Subsurface Scattering
Portal Light
Renderman

In-Class Exercises- MR ex, Hand

Assignment: Light Scene- Car w/ HDR

Required Reading pg. 338-357, 375-411, 416-424 Lanier

Week 6: *Introduction to Texturing 1*

Texturing Fundamentals
UV Mapping
3D Texture Painting
Texture Nodes- 2D
Texture Nodes- 3D
Label Mapping
Projection Types

In-Class Exercises

Assignment: UV Map Scene- Silo

Required Reading pg. 103-133, 266-272 Lanier

Week 7: *Introduction to Texturing 2*

Animated Maps
Mipmaps
Mapping Fractal Noise
Ramp Texture
Layered Textures
Environment Textures
PSD Texture Node

In-Class Exercises

Assignment: Texture Scene- Silo, Train

Week 8: *Introduction to Shaders 1*

Basic Shader Review
Advanced Shader Review
Shader Networks
Data Types and Flow
Color Mult and Offset
Age and Weathering
Specular Mapping

In-Class Exercises- Sunset, Ramp, Weathering

Assignment: Render Scene- Train, Silo

Required Reading pg. 170-176, 234 Lanier

Week 9: *Introduction to Shaders 2*

Rendering Metals
Bump and Displacement Mapping
Rendering Glass
Use Background Shader

In-Class Exercises

Assignment: Render Scene- Train, Silo

Required Reading pg. 129-133, 289-293, 366-371 Lanier

Week 10: *Introduction to Shaders 3*

Utility Nodes
Facing Ratio
Surface Luminance
FX Animation w/ Shaders

In-Class Exercises

Assignment: Render Scene-Train, Silo

Required Reading pg. 201-227 Lanier

Week 11: *Camerawork*

Basic Camera Attributes
Perspective Correction
Camera Animation Strategies
Curve Randomization
Shaker Node
Tracked Curves
Multi-Node Camera Setup
Motion Control Rigs
Camera Projection

In-Class Exercises

Assignment: Animate Camera in Scene

Week 12: *Production Rendering*

Rendering by Layer
Z-Depth Rendering
OpenEXR Format
Depth of Field
Vector Motion Blur

In-Class Exercises

Assignment: Render Scene- Train, Silo

Required Reading pg. 301-331, 405, 438-445 Lanier

Week 13: *Compositing Technique in Rendering*

Nuke vs Shake vs AfterEffects
Nodal Trees
Sweetening CG Renders

In-Class Exercises

Assignment: Composite Scene- Train, Silo

Week 14: *Wrap Up/ Studio Help*

Week 15: *Wrap Up/ Last Class*

Final Exam, Submission of Final Project, Tues Dec 13, 11-1pm.

STUDENTS WITH DISABILITIES:

Any student requesting academic accommodations based on a disability is required to register withDisability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure that the letter is delivered to the Professor as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

MISSING AN EXAM, INCOMPLETES:

The only acceptable excuses for missing an exam or taking an incomplete in the course are personal illness or a family emergency. Students must inform the professor before the exam and present verifiable evidence in order for a make-up to be scheduled. Students who wish to take incompletes must also present documentation of the problem to the instructor or teaching assistant before final grades are due and are available only after the week 12 withdrawal deadline.

ACADEMIC INTEGRITY:

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.