



# 3D Compositing and Visual Effects

## ITP 360x (3 Units)

Fall 2012

<b>Objective</b>	Advanced techniques for 3D animation and visual effects development; including 3D previsualization, match moving, dynamics, multi-pass rendering, and digital compositing.
<b>Concepts</b>	Camera and advanced photographic applications for 3D including: Camera tracking and match moving, linear workflows, HDRI, lighting, and global illumination. Advanced materials, lighting, and rendering techniques. Multi-pass rendering and node based compositing.
<b>Prerequisites/ Recommended Preparation</b>	ITP 215x
<b>Instructor</b>	Lance S. Winkel
<b>Contacting the Instructor</b>	Office: OHE 530 H E-mail: <a href="mailto:winkel@usc.edu">winkel@usc.edu</a> Tel: 213.740.9956
<b>Office Hours</b>	Tuesdays, 2-3pm, and Thursdays 9-10:30am, and 2-3pm
<b>Lab Assistants</b>	TBD
<b>Lecture</b>	1.5 hours per week
<b>Lab</b>	1.5 hours per week
<b>Course Structure</b>	<p>The course material will be structured around a series of weekly exercises culminating in an elaborate full group 3D production team. Each project will extend over several weeks with assignments / progress checks due each week. See the Grading criteria below.</p> <p>The anticipated Course Outline contains a weekly breakdown of the lecture material and assignment due dates.</p>
<b>Recommended Textbooks</b>	<p>Cinematics Storyboard Workshop Gregg Davidson, (978-0977861101)</p> <p>Digital Lighting and Rendering (2<sup>nd</sup> edition) (Paperback) Jeremy Birn, (ISBN: 978-0321316318)</p> <p>Compositing Visual Effects (Paperback) Steve Wright, (ISBN 978-0-240-80963-2)</p>

**Optional Books** Maya Professional Tips and Techniques (Paperback)  
Lee Lanier, (ISBN: 978-0470107409)

**Web Site** Class materials are posted on the USC Blackboard website.  
<https://blackboard.usc.edu/>

**Grading** Twelve weekly assignments/progress checks = 10 points each (120 total)  
Midterm – Finished Composite Project = 40 points  
Final Project = 60 points  
Attendance / Participation = 30 points (-10 points / absence)  
Total = 250 points

A	100-93
A-	92-90
B+	89-87
B	86-83
B-	82-80
C+	79-77
C	76-73
C-	72-70
D+	69-67
D	66-65
F	64 or below

FINAL PROJECT DUE AT START OF FINAL EXAM SESSION:  
Tuesday, December 17, 4:30-6:30pm, OHE 542

**Policies** Attendance: The course content and projects are so closely tied together; excessive absences will severely and negatively affect the learning process. Any student who misses three or more classes will fail the course.

Projects: All projects and weekly assignments are due at the start of class and are considered late ½ hour after class begins. Only one project or assignment may be turned in late. All other late projects will NOT be accepted unless pre-approved by the instructor. With the instructor's approval, on time projects may be redone for additional credit but must be turned in by the following class session. The final project may not be turned in late.

Before logging off a computer, students must ensure that they have emailed or saved projects created during the class or lab session. Any work saved to the computer will be erased after restarting the computer. ITP is not responsible for any work lost.

ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes. Please contact your instructor for specific times and days for the current semester.

**Academic Integrity** The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or

other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the professor determines that a violation has occurred, appropriate action, as determined by the instructor, will be taken.

Although working together is encouraged, all work claimed as yours must in fact be your own effort. Students who plagiarize the work of other students will receive zero points and possibly be referred to Student Judicial Affairs and Community Standards (SJACS).

All students should read, understand, and abide by the University Student Conduct Code listed in SCampus, and available at:

<http://www.usc.edu/student-affairs/SJACS/nonacademicreview.html>

**Students with  
Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to your TA) 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.

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## Course Outline

### Week 1 – Introduction and Toolsets

- Introduction to the class and course syllabus
- Brief history of compositing and visual effects
- Deconstructing digital images and the rendering process
- Fundamental 3D and digital compositing principles
- Comparing compositing engines (Nuke and After Effects)
- RenderMan in Maya

**Project:** Acquire one of your Maya 3D scene files from a previous class. Reconfigure and set up the scene to render through RenderMan. Adjust and optimize Shaders, Lights, Render Globals, and Advanced Settings.

### Week 2 – Intro to Renderman

- RenderMan beyond Maya: Slim, It, and Alfred
- RenderMan workflow
- Comparing RenderMan to other rendering packages
- Basic shaders and tools

**Project:** Use Slim to develop a complex custom shader. Integrate it into a Maya scene and render using RenderMan. Resumes due next week for production team.

### Week 3 – Building a 3D production team

- Scheduling and Planning,
- Team Building
- Defining roles
- Organization structure and workflow
- Prioritizing objectives
- Previsualization
- RenderMan texturing and proprietary materials

**Project:** Plan and start a team project. Define the project. Define the rolls and responsibilities of the team members. Storyboards, asset lists, and breakdowns due next week but must be ready for pitch and strategy sessions with programming teams Week 5.

#### Week 4 – Materials and Texturing

- Understanding the RenderMan specification (PRMan)
- Using advanced renderers
- RenderMan texturing pipeline
- Scripting and procedures
- Weathering and detail
- Combining multiple textures across material properties
- Team meeting and initial concept review
- Defining a look

**Project:** Continue developing the story. Working as a team, develop and render several samples to define the anticipated “look” and of the project. These should include rough shaders, lights and shadows, and a sense of the anticipated nostalgia and “feel” of the finished piece.

#### Week 5 – Planning: Programming and Production Team Meetings (Combined Class)

- Lights and shadows in RenderMan
- Primary vs. Secondary Illumination
- Cinematography vs. tools
- Defining a look
- Three-point lighting
- Gestural lighting
- Share contact information!!!!

**Project:** Both the Programming Teams and production teams have presented and discussed their ideas. Based on these initial meetings evolve and refine the project to make use of the tools that will eventually be forthcoming from the Programming Teams. ***Note: It will be several weeks before the Programming Teams can develop their shaders and tools. Until then; collaborate and work with the programming teams while moving into full production within your production teams.***

#### Week 6 – 3D Pre-visualization

- Dissecting a storyboard
- Asset lists and preparing a production workflow
- Scale, measurement, and proportion
- Building 3D visualizations from storyboard content
- Special Topic subject to be determined
- Network and distributed rendering for multi-pass rendering
- Using Excel in the animation process – god forbid!

**Project:** Build a production plan and strategy for the remainder of the course. Individual roles. Asset lists. Keep working!

### **Week 7 – Crew meetings**

- Content specific to production needs
- RenderMan
- Defining a look
- Lighting and shading for photorealism
- Lighting and shading for stylistic rendering
- Sweetening the deal. Color, shading, tricks for emphasis.

**Project:** Keep working!

### **Week 8 – Film, video, standards, mattes and file formats**

- Deconstructing film, video, and digital video standards
- Aspect ratios, file formats, and frame rates
- Types of mattes and matting techniques
- Making and mattes for 2D elements vs. 3D elements

**Project:** Keep working!

### **Week 9 – Film, video, standards, mattes and file formats**

- Specialty layers and channels
- Z-Depth vs. Luminance depth
- Image bit depth, 8-bit vs. 16bit vs. floating point
- Object IDs and the power of custom render passes
- Node based compositing principles and techniques
- Color correction and post effects

**Project:** Keep working! Projects should be very far along at this phase. Next week you will be working directly with the programmers to implement their initial (beta) shaders into your scenes. Be prepared to take notes and have your scenes ready to be worked on in class.

### **Week 10 – Implementation: Programmer and Production Team Meetings (Combined Class)**

- Incorporating and testing custom shaders
- The importance of software testing in the production pipeline

**Project:** Work with your teams and software developers to begin integrating custom shaders into the animated productions.

### **Week 11 – Post processing and compositing**

- Tools, applications, and plug-ins for efficiency
- Open EXR
- Third party renderers and production applications
- Preparing content across multiple production packages

**Project:** Work within your production crews to continue finishing up the projects. Work with programmers to continue incorporating and refining the implemented shaders. Four weeks left!

### Week 12 – Refining performance

- Using the graph editor to fine tune a performance
- Secondary motion

**Project:** Work within your production crews to continue finishing up the projects. Work with programmers to continue incorporating and refining the implemented shaders. Three weeks left!

### Week 13 – Dynamic particle systems

- Adding and using dynamics effects to a scene
- Customizing particle effects
- Rendering dynamics
- Compositing dynamics

**Project:** Work within your production crews to continue finishing up the projects. Work with programmers to continue incorporating and refining the implemented shaders. You should be rendering and polishing. Two weeks left!

### Week 14 – Mental Ray and special topics in 3D rendering

- Differences between the software and Mental Ray renderer
- Benefits of Mental Ray
- Final gathering
- Image based lighting (IBL) and High Dynamic Range Images (HDRI)

**Project:** Work within your production crews to continue finishing up the projects. Work with programmers to continue incorporating and refining the implemented shaders. You should be rendering and compositing and editing. Due next week!

### Week 15 – Project Presentations (Combined Classes)

- Project Presentations
- Postmortem Team Reviews
- Critique and Discussion

**Project:** Use the two weeks leading to the final exam to polish any complete the production. While Week 15 is the public display, I will reserve final judgement and grading on the productions until the Final Examination day – so use this time wisely!

**Evaluations:** **Individually** - complete an individual performance evaluation for yourself and each of your group mates according to the rubric I have provided.  
**As a group** - complete the team evaluation rubric to for each of the programming teams.

### Week 16 – Final – Tuesday, December 17, 4:30-6:30pm, OHE 542

Final projects must be submitted onto Blackboard by 3pm.  
In class review and critique of Final Projects will follow.