



3-D Modeling, Animation, Compositing, and Special Effects ITP 215 (2 Units)

Spring 2013

Objective Overview of developing a 3D animation—from modeling to rendering: Basics of surfacing, lighting, animation, and modeling techniques. Advanced topics: compositing, particle systems, and character animation.

Concepts Fundamentals of 3D modeling, animation, surfacing, and special effects: Understanding the processes involved in the creation of 3D animation and the interaction of vision, budget, and time constraints. Developing an understanding of diverse methods for achieving similar results and decision-making processes involved at various stages of project development. Gaining insight into the differences among the various animation tools. Understanding the opportunities and tracks in the field of 3D animation.

**Prerequisites/
Recommended
Preparation** Knowledge of any 2-D paint, drawing, or CAD program.

Instructor Lance S. Winkel

**Contacting the
Instructor** Office: OHE 530 H
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Office Hours Thursdays 5-8pm in OHE540 or by appointment

Lab Assistants Michael Pattison
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Lecture 1.5 hours per week

Lab 1.5 hours per week

**Course
Structure** The course material will be structured around a series of projects. Each project will extend over several weeks with assignments / progress checks due each week. See the Grading criteria below.

The anticipated Course Outline contains a weekly breakdown of the lecture material and assignment due dates.

**Recommended
Textbooks**

Optional Books

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

Grading Ten weekly assignments / progress checks = 10 points each (100 total)
Cityscape project = 20 points
Chess Animation project = 20 points
Character Animation project = 20 points
Final project = 60 points
Attendance and 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

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 – Lecture Title

- Survey of student and 3D animation experience
- Overview of course plan and objectives
- Introduction to the Maya GUI
- Basic 3D transforms (translation, rotation, scaling) and animation
- Maya's Online Help
- Online resources: Highend3d.com & Learning-Maya.com
- Supplemental learning resources and recommended reading

Project: Animate the planets in the provided scene. Learn familiarity with the Maya interface, including object selection, navigation, setting animation keys, and basic transforms

Week 2 – Creating a 3D scene from primitives

- Further introduction to the Maya GUI
- Polygon components (vertices, edges, faces)
- Creating and editing geometry from primitives
- Groups and Hierarchies
- Duplication vs. Instancing

Project: Cityscape (Week 1 of 5) - Create a metropolitan landscape from primitives and simple hierarchies. At least three (3) unique structures.

Week 3 – Polygon mesh editing tools

- Additive vs. subtractive modeling
- Manually manipulating component
- Splitting polygons vs. deleting edges
- Polygon extrusion

Project: Cityscape (Week 2 of 5) - Populate the scene with at least three (3) new sculpted polygon objects. One objects should be a vehicle of some form.

Week 4 – Materials and Texturing

- Understanding UV texture space
- Simple UV projection
- Introduction to materials and textures
- Basic lighting

Project: Cityscape (Week 3 of 5) - Assign materials and textures to the objects with the scene.

Week 5 – Cameras and lighting

- Review key framing techniques
- Animating props and cameras
- Using the Render Settings window to prepare a scene for render

Project: Cityscape (Week 4 of 5) - Layout and stage the objects in the scene to create a complex environment. Light the scene to establish a specific mood. Create a custom camera. Animate the camera and vehicle into a 5 to 10 second shot.

Week 6 – Animation, Rendering, and Output Techniques

- Rendering image sequences from Maya
- Importing image sequences into post production and compositing programs
- Creating QuickTime movies

Project: Cityscape (Week 5 of 5) - Setup the animated scene for rendering. Render the scene out as a sequence of images and then import the sequence into the post compositing program for final QuickTime output.

Week 7 – NURBS and spline-based modeling

- Basic NURBS spline-based modeling concepts
- NURBS to polygon conversion
- Boolean modeling techniques
- Construction history
- Essential steps to prepare a character model for animation

Project: Chess Animation (Week 1 of 3) - Build at least two different chess pieces using NURBS and/or polygon techniques. Prep the Pieces for use in class next week.

Week 8 – Basic character setup

- Non-linear deformers
- Deformation order
- Hierarchies for animation

Project: Chess Animation (Week 2 of 3) - Setup and begin animating at least one of the chess pieces through a 100 frame animation.

Week 9 – Animating a simple character

- Key framing tools and techniques
- Using the Graph Editor
- Understanding motion curves, keys, and tangents

Project: Chess Animation (Week 3 of 3) - Finish animating the chess pieces and render the scene.

Week 10 – Posing a character

- Working with Forward Kinematics (FK) and skeleton hierarchies
- FK keying process
- Strong poses
- Animating to the camera

Project: Character Animation (Week 1 of 3) - Character posing exercise with a pre-rigged character.

Week 11 – Blocking out a performance

- Working with Inverse Kinematics (IK) and skeleton hierarchies
- IK keying process
- Breaking down a performance
- Anticipation, weight, and timing

Project: Character Animation (Week 2 of 3) - Using the familiarity with the rig that you gained from the previous weeks exercise, break down a performance into gestures. Using the pre-rigged character, block in the poses and then refine the timing.

Week 12 – Refining performance

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

Project: Character Animation (Week 3 of 3) - Continue refining the animation. Use the graph editor and add more keys to polish the performance.

Week 13 – Dynamic particle systems

- Adding and using canned effects to a scene
- Customizing particle effects

Project: Dynamics - Add dynamic effects to one of the previous 3D projects.

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: Final Project: Due at the start of our Finals Week class session.
In-class screening and critique will follow

Week 15 – Compositing and final polishing techniques

- Material Covered

Project: Final Project Proposals Due & Progress Check

Week 16 – Final – Tuesday, May 8, 2-4pm, OHE 540

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