



# 3D Modeling, Animation, and Special Effects ITP 215x (2 Units)

Fall 2008

**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:

- Understand the processes involved in the creation of 3D animation and how to balance the interaction of vision, budget, and time constraints within productions.
- Develop an understanding of the diverse methods available for achieving similar results and the decision making processes involved at various stages of project development.
- Gain insight into the differences among various animation tools.
- Understand the opportunities and career tracks available within the field of 3D animation.

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

**Instructor** Lance S. Winkel

**Contacting the Instructor** E-mail: [winkel@usc.edu](mailto:winkel@usc.edu)  
Tel: 213.740.9956

**Office Hours** Varies by semester

**Lab Assistants** TBA

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

**Required Textbooks** **Learning Autodesk Maya 2008: Foundation** (Paperback)  
Autodesk Maya Press (ISBN: 978-1897177426) (Amazon \$38.49)

**Optional Books** The Art of Maya: An Introduction to 3D Computer Graphics (Paperback)  
Autodesk Maya Press (ISBN: 978-1897177471)

**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	66-63
D-	62-60
F	59 or below

**Policies** Attendance: The course content and projects are 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 to 3D Animation

- 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

**Reading:** Maya 2008, Foundation - Lessons 1 and 2

**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

**Reading:** Maya 2008, Foundation - Lessons 3 and 4

**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

**Reading:** Maya 2008, Foundation - Lessons 5 and 6

**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

**Reading:** Maya 2008, Foundation - Lessons 7 and 8

**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

**Reading:** Maya 2008, Foundation - Lessons 9 and 10

**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

**Reading:** Maya 2008, Foundation - Lessons 11 and 12

**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

**Reading:** Maya 2008, Foundation - Lessons 13 and 14

**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

**Reading:** Maya 2008, Foundation - Lessons 15 and 16

**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

**Reading:** Maya 2008, Foundation - Lessons 17 and 18

**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

**Reading:** Maya 2008, Foundation - Lessons 19 and 20

**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

**Reading:** Maya 2008, Foundation - Lessons 21 and 22

**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

**Reading:** Maya 2008, Foundation - Lessons 23 and 24

**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

**Reading:** Maya 2008, Foundation - Lessons 25 and 26

**Project:** Final Project: Due at the start of our Finals Week class session. In-class screening and critique will follow. See the Final Assignment details below. Final Project storyboards and proposals are due Week 14.

**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)

**Reading:** Maya 2008, Foundation - Lessons 27 and 28

**Project:** Final Project Proposals Due & Progress Check. Continue working on Final Project.

**Week 15** – Compositing and final polishing techniques

- Networked and distributed rendering
- Compositing and post effects

**Reading:** Maya 2008, Foundation - Lessons 29 - 32

**Project:** Progress Check. Continue working on Final Project.

**Week 16** – Final (Date)

**ITP 215 - Final Project:**

Choose one of the previous three projects from this class. This will serve as your departure point for the course Final. Your goal for the final is to reinvent that project from the ground up by embellishing details, adding to and refining performance, improve the lighting and compositing, and work the project to a perfect shine.

Regardless of which project you wish to engage further, your final must include at least three shots and be at least 15 seconds long. Also, you must incorporate dynamic effects into the scenes and use compositing techniques to refine the final product. Depending upon which project you choose, I would like to see the following:

**Option 1 - Cityscape**

- Add dynamics to the scene
- Add geometry and textures as necessary in order to push the Cityscape environment further. Embellish details and fill up empty areas.
- Further develop the animation and lighting
- Apply deeper level compositing techniques to make the final look polished.

**Option 2 - Chess Character Animation**

- Add dynamics to the scene
- Add to, refine, and improve on the current animation. Emphasize some sort of simple story.
- Texture and light the scene.
- Elaborate on the environment that exists beyond the chess board.
- Apply deeper level compositing techniques to make the final look polished.

**Option 3 - Character Animation**

- Add dynamics to the scene
- Add to, refine, and improve on the current animation. Emphasize some sort of simple story.
- Build an environment to go along with the performance

- Texture and light the scene.
- Apply deeper level compositing techniques to make the final look polished.

The Final project is worth 60 points. Progress checks are due each week leading up to the Final deadline. The Final project will be graded based on:

- Demonstrated effort
- Complexity, range, and effective use of tools
- Quality of the finished product (performance, visual quality, etc.)