

3D Modeling, Animation, Compositing, and Special Effects

ITP 215x (2 Units)



Spring 2015

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

Knowledge of any 2-D paint, drawing, or CAD program.

Instructor

Lance S. Winkel

Contacting the Instructor

Email Address: winkel@usc.edu
OHE 530 H

Office Hours

Listed on Blackboard under Contacts

Lab Assistants

Lecture

1.5 hours per week

Lab

1.5 hours per week

Required Textbooks

Learning Maya from Autodesk Press for current annual software version
Resources online and at [Lynda.com](http://lynda.com) and knowledge.autodesk.com

Website

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

Grading Scale

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

Projects: All projects and weekly assignments are due at the start of class and are considered late 1/2 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.

Incomplete and Missing Grades

Excerpts for this section have been taken from the University Grading Handbook, located at <http://www.usc.edu/dept/ARR/grades/gradinghandbook/index.html>. Please see the link for more details on this and any other grading concerns.

A grade of Missing Grade (MG) "should only be assigned in unique or unusual situations... for those cases in which a student does not complete work for the course before the semester ends. All missing grades must be resolved by the instructor through the Correction of Grade Process. One calendar year is allowed to resolve a MG. If an MG is not resolved [within] one

year the grade is changed to [Unofficial Withdrawal] UW and will be calculated into the grade point average a zero grade points.

A grade of Incomplete (IN) “is assigned when work is not completed because of documented illness or other ‘emergency’ **occurring after the twelfth week** of the semester (or 12th week equivalency for any course scheduled for less than 15 weeks).”

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/>.

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 your course instructor (or TA) as early in the semester as possible. DSP is located in STU 301 and is open from 8:30am to 5:00pm, Monday through Friday. Website and contact information for DSP http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu

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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 – Due at start of Final Exam session, OHE 540, TBD

Final projects must be submitted onto Blackboard by 3pm.

In class review and critique of Final Projects will follow.

Final Project:

Due at start of Final Exam session, OHE 540, TBD

Must be submitted onto Blackboard by no later than 15 minutes after the START of our Final Exam session – room and time based on Final Exam schedule.

Using any and all of the techniques we have covered in the class thus far, create a 20 second animated sequence consisting of at least four consecutive shots. You may do more if you feel ambitious.

A complete Final Project submission will consist of a finished rendered QuickTime movie file as well all Maya scene files, project folders, textures, and supporting materials.

QuickTime file should be Sorensen 3 codec; 640x480 minimum resolution, HD and other aspect ratios are okay.

- At least three new detailed assets must be built and showcased in this project.
 - An asset can be anything from a building, to an environment, to a detailed prop, to a vehicle, or even a full character.
 - In order to optimize your time, you may use any previous assets and models to supplement this project. If you are recycling assets in this way, make sure to significantly improve them so that they compliment this new project (i.e. better texturing, shape language, edge topology, or detailing.)
- Demonstrate your best animation in the project
 - Weight
 - Timing
 - Controlled key-framing
 - Secondary animation.

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:

- Meets base requirements (20 seconds, four consecutive shots, rendered)

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

Have fun! Make awesome work!