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

Fall 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 E-mail: winkel@usc.edu Tel: 213.740.9956
Office Hours	Tuesdays, 2-3pm, and Thursdays 9-10:30am, and 2-3pm
Lab Assistants	Cameron McClees E-mail: mcclees@usc.edu
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.

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

Course Outline

Week 1 Tuesday – Syllabus and Course Introduction
- Survey of student and 3D animation experience
- Overview of course plan and objectives
- Online resources: Highend3d.com & Learning-Maya.com
- Supplemental learning resources and recommended reading

    Project: Download and install Maya from Autodesk

Week 1 Thursday – Syllabus and Course Introduction
- Introduction to the Maya GUI
- Basic 3D transforms (translation, rotation, scaling) and animation
- Maya's Online Help

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

Week 2 Tuesday – Creating a 3D scene from primitives
- Further introduction to the Maya GUI
- Polygon components (vertices, edges, faces)
- Creating and editing geometry from primitives

    Project: Cityscape (Week 1 of 7) - Create a metropolitan landscape from primitives and simple hierarchies. At least three (3) unique structures. See blackboard for specific details.

Week 2 Thursday – Creating a 3D scene from primitives
- Arrayed Duplication
- Groups and Hierarchies
- Duplication vs. Instancing

    Project: Cityscape (Week 1 of 7) – Continued.

Week 3 Tuesday – Polygon mesh editing tools
- Additive vs. subtractive modeling
- Manually manipulating component
- Splitting polygons vs. deleting edges

Project: Cityscape (Week 2 of 7) - Populate the scene with at least three (3) new sculpted polygon objects. One object should be a vehicle of some form. See blackboard for specific details.

Week 3 Thursday – Polygon mesh editing extrusion
- Polygon extrusion
- Other hybrid tools
- Building sample model

Project: Cityscape (Week 2 of 7) – Continued.

Week 4 Tuesday – Materials and Texturing
- Introduction to materials
- Basic rendering nodes
- Simple overview of the rendering pipeline

Project: Cityscape (Week 3 of 7) - Assign materials to the objects with the scene. See blackboard for specific details.

Week 4 Thursday – Basic Texturing
- Introduction to textures
- Defining textures vs. materials
- Assigning textures to material attributes

Project: Cityscape (Week 3 of 7) - Continued

Week 5 Tuesday – Texturing and UV Coordinate Space
- Understanding UV texture space
- Simple UV projection
- Similarities between manipulating UV coordinates and polygon components
- General workflow for UV unwrapping and export to image manipulation software.

Project: Cityscape (Week 4 of 7) - Assign textures to the objects with the scene. See blackboard for specific details.

Week 5 Thursday – Texturing Pipeline and Texture Painting
- Types of textures (color, specular, bump, and incandescence)
- Exporting UV template
- Painting textures using image manipulation software
- Techniques for layer based image manipulation
- Assigning textures to material attributes

Project: Cityscape (Week 4 of 7) - Continued

Week 6 Tuesday – Overview of cameras and optics
- Overview of cameras, terms and techniques
- Maya's virtual camera and settings
- Camera setup
- Film gate, aperture, aspect ratio, lens focal length, zoom vs. prime lenses, and other standards.

Project: Cityscape (Week 5 of 7) – Setup a camera in Maya. Use that as a viewport to layout and arrange the objects in the scene to create a complex environment. See blackboard for specific details.

Week 6 Thursday – Cameras in 3D
- Cinematography references
- Good and bad camerawork and composition
- Laying out and populating a 3D scene
- Animating a camera

Project: Cityscape (Week 5 of 7) – Continued.

Week 7 Tuesday – Lighting in 3D
- Basic 3D lighting models
- Types of lights
- Good lights (directional, spot, point, and area)
- Bad lights (ambient and volume)
- Ray traced and depth mapped shadows
- Using the Render Settings window to prepare a scene for render

Project: Cityscape (Week 6 of 7) - Light the scene to establish a specific mood. Create a custom camera. Animate the camera and vehicle into a 5 to 10 second shot. See blackboard for specific details.

Week 7 Thursday – Animating a vehicle
- Review key framing techniques
- Animating with basic hierarchies
- Techniques to produce better performance
- Animating props and cameras
- Using the Render Settings window to prepare a scene for render

Project: Cityscape (Week 6 of 7) – Continued.

Week 8 Tuesday – Rendering
- Rendering image sequences from Maya
- Importing image sequences into post production and compositing programs
- Creating QuickTime movies
- Why you only render image sequences (never render movie files!)

Project: Cityscape (Week 7 of 7) – 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. See blackboard for
specific details.

Week 8 Thursday – History of 3D Computer Graphics
- Why Tron is the most important movie in the history of mankind… or at least 3D
- The hurdles and limitations of early 3D
- Trace the major innovations of 3D and technology over the last 30 years, from early experiments through the modern production and business models of today.

Project: Cityscape (Week 7 of 7) – Continued.

Week 9 Tuesday – NURBS Overview
- Basic NURBS spline-based modeling concepts
- Defining NURBS and NURBS components
- Advantages to NURBS

Project: Chess Animation (Week 1 of 3) - Build at least two different chess pieces using NURBS and/or polygon techniques. See blackboard for specific details.

Week 9 Thursday – NURBS and spline-based modeling
- Working with NURBS Curves
- Curve editing, Attachment, Detachment, and Rebuilding
- Converting curves into surfaces
- Using revolve to form the chess shape from a profile
- 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) – Continued.

Week 10 Tuesday – Basic character setup
- Non-linear deformers
- Deformation order
- Hierarchies for animation

Project: Chess Animation (Week 2 of 3) - Setup and begin animating at least two of the chess pieces through a 5 - 10 second animation. See blackboard for specific details.

Week 10 Thursday – Advanced character setup concepts
- Custom attributes
- Connection editor
- Input and Outputs

Project: Chess Animation (Week 2 of 3) – Continued.

Week 11 Tuesday – Animating a simple character
- Planning a performance
- 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 using the same procedures as we used at the end of the previous project. See blackboard for specific details.

Week 11 Thursday – Refining the performance
- Refining and further developing an animation
- Fine tuning the timing and performance
- More Graph Editor

    Project: Chess Animation (Week 3 of 3) – Continued.

Week 12 Tuesday – The Final Project
- Solve any animation problems with the Chess Animation
- Discuss the Final Project
- Overview of the remaining timeline for the class

    Project: Final Project: Discuss the final project. See blackboard for specific details. Due at the start of our Finals Week class session. In-class screening and critique will follow. Progress checks will be due each week.

Week 12 Thursday – Animating a character
- Animating a full human character using a pre-rigged character rig
- Blocking in a performance
- IK and FK concepts
- Working with a rig

    Project: Continue Final Project.

Week 13 Tuesday – Visual Effects in 3D
- Adding and using canned effects to a scene
- Customizing particle effects

    Project: Final Project Proposals Due & Progress Check

Week 13 Thursday – Advanced Rendering topics
- Batch Rendering
- Command line rendering
- Rendering across multiple machines
- Networked, farmed, and distributed rendering
- Types of renderers

    Project: Continue Final Project.

Week 14 Tuesday – 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: Continue Final Project.

Week 14 Thursday – Thanksgiving Holiday

       Project: **Don't be at school. Eat!**

Week 15 Tuesday – Special Topics and Open Lab
- To be determined based on course needs

Week 15 Thursday – Special Topics and Open Lab

- To be determined based on course needs

Week 16 – Final – Tuesday, December 17, 2-4pm, OHE 540

       Final projects must be submitted onto Blackboard by 3pm.
       In class review and critique of Final Projects will follow.
       All students must attend Final Exam session!