3D Character Animation
ITP 315x (3 Units)

Fall 2014

Objective

This advanced 3D animation course explores the process of bringing 3D characters to life; from concept, through production, to finished performance.

Concepts

Students will begin with a crash course in performance and animation fundamentals. Subsequent projects will take the student through the entire production of an original 3D character including organic modeling, character setup, and texturing. The final phase of the class will take the animation production process full circle. Characters will be animated and composited along with live action, dynamics, and visual effects into a complete short animated film.

Prerequisites

ITP 315

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

None
Resources online and at Lynda.com and knowledge.autodesk.com
Recommended texts and other resources listed on Blackboard

Website

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

Grading

Eleven weekly assignments / progress checks = 10 points each (110 total)
Animation Project One = 20 points
Character Project = 20 points
Rigging Project = 20 points
Final Animation Project = 50 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 no 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

3D Modeling, Animation, Compositing, and Special Effects
ITP 315x (3 Units)

Course Outline

Week 1 – Introduction and review of animation principles

- Introduction to the class
- Overview of course plan and objectives
- Review of basic animation principles
- Planning a performance based on story
- Thinking through and breaking down motions

Project: Animation Project One (Week 1 of 3): Using a video camera, record several takes of a five to ten second performance that reveals a character dramatically changing emotions. While using another person as an actor is okay, for the purposes of understanding the physicality of the performance, it is much more preferable for you to act out the performance yourself. Also, shoot several subsequent shots of the action with the actor emoting to the camera for facial study. Isolate the best performance. Using the supplied character rig, block out the actions for the performance as key poses. Strong gesture and silhouette are encouraged. Due Week 2.

Week 2 – Intermediate Animation and Timing Techniques

- Building stronger poses and timing
- Review of animation curve editing tools and techniques

Project: Animation Project One (Week 2 of 3): Based on initial critique, refine and improve the key poses to enhance and push the performance. Continue adding keys and fleshing out the main physical performance. Due Week 3.

Week 3 – Facial Animation Techniques

- Preparing and importing audio for facial animation timing
- Animating faces for emotion and dialogue

Project: Animation Project Three (Week 3 of 3): With the physical performance captured, and a camera setup to center on the face, import the audio and animate the facial phonemes. Due Week 4.

Week 4 – Fundamental Character Modeling Techniques

- 3D Modeling fundamentals
- Why character design should support the story
- Building a smart and efficient character base mesh

Project: Character Project (Week 1 of 4): Based on a rough concept and the story details handed out in class, design the character to support the modeling, rigging, and animation that will be required throughout the remainder of the course. Block out the character using the techniques demonstrated in class. Due Week 5.

Week 5 – Musculature and Detail Modeling Techniques

- Intermediate 3D character modeling concepts and techniques
- Edge loops
- Details, contours, and profile
- Musculature and anatomy

Project: Character Project (Week 2 of 4): Fix any early design issues, overly complex geometry, proportion problems, and/or bad edge loops. Add in details and musculature evenly across the entire character, taking care not to overwork any specific area too heavily too quickly. Remember that every vertex should contribute to the shape of the object. Vertices that are not contributing to shape are a waste and should be removed, or adjusted. Fingers, muscles, and details should be complete. Due Week 6.

Week 6 – Facial Modeling Techniques

- Defining facial features and anatomical primitives
- Facial modeling and edge looping techniques

Project: Character Project (Week 3 of 4): Fix any problems. Work out any shape or proportion problems before moving on to the facial features. Starting with anatomical primitives, model in the eyes and mouth with attention to strong evenly distributed edge loops. With eyes and mouth complete, model in the remainder of the facial details, and then combine all of the facial features into the head. Due Week 7.

Week 7 – Character Model Cleanup and Rigging Preparation

- Final cleanup considerations
- Clothing, armor, and prop building
- Preparing to make the character move

Project: Character Project (Week 4 of 4): Refine and add any final anatomical details to the character. Build in any remaining clothing, armor, and props. Cleanup the model and complete final preparations to rig the character beginning next week. Due Week 8.

Week 8 – Character Skeleton Construction

- Understanding character movements and kinematics
- Predicting the needs of a character rig based on story necessity
- Building skeletons to drive 3D character movement
- Review of hierarchies, history, and deformation order
- Goal vs. arc based motion

Project: Rigging Project (Week 1 of 5): Assess the needs of story and begin rigging the character model by building a skeleton joint hierarchy. Completely name all joints. Freeze transforms, orient joints, add IK/FK, and any additional controls as necessary. Due Week 9.

Week 9 – Character Skinning Techniques

- Proper posing for healthy character deformation
- Relaxed Pose vs. T-Pose
- 3D Character skinning techniques
- Painting and refining character skin weights
- Deformation systems

Project: Rigging Project (Week 2 of 5): Properly align the character rig and joint skeleton. Bind the character to the rig and begin resolving any problems with the initial bind. Due Week 10.

Week 10 – Facial Rigging Techniques

- Techniques for facial deformation
- Blend shape based facial movement
- Modeling facial deformation targets
- Joint based facial movement
- Advanced topics on deformation order

Project: Rigging Project (Week 3 of 5): Assess the needs of the performance to determine which expressions need which type of deformer based on the character model. Temporarily zero out the influence of the bind deformation. Duplicate the geometry of the character, and begin modeling facial expressions and phoneme targets. Once complete, apply the expressions to the character using a blend shape deformer. Build and add joint influence for any additional joint driven expressions. Due Week 11.

Week 11 – Advanced Character Rigging and controls

- Character control and integration
- Custom attributes and advanced control techniques
- Connecting attributes, expressions, and set driven keys

Project: Rigging Project (Week 4 of 5): Add attributes and control nodes as necessary to streamline performance. Use expressions and driven keys to better automate animation of the character. Due Week 12.

Week 12 – Character Rig Final Phase Testing Methods

- Hands on testing of the completed character rig
- Customizing interface and camera controls to optimize the animation process.
- Developing the story for the final animation project

Project: Rigging Project (Week 5 of 5): Based on the in-class testing and feedback for the character rigs, make final changes and improvements as necessary. Lock and hide unnecessary or vulnerable aspects of the rig. Story concepts and storyboards are also due. Due Week 13.

Week 13 – Preparing to animate

- Camera and scene setup
- Props
- Blocking in for elaborate movement and interaction
- Working with dynamics and other scene complexities.

Project: Final Animation Project (Week 1 of 3): Make story changes and improvements to storyboards and layout based on in-class critique. Begin animating the final project. See the Final Project details below.

Week 14 – Enhancing character performance with dynamic effects

- Critique of blocked-in animation
- Adding Dynamic effects to enhance character performance
- Object emission characteristics
- Surface matting techniques
- Dust, rain, sweat, splashing, fire, and wind techniques

Project: Final Animation Project (Week 2 of 3): Continue work on the final project. Incorporate dynamic effects to the final as necessary.

Week 15 – Special Topics in Character Animation and 3D Special Effects

- Combing 3D character convincingly into a live action scene
- Matching lighting, texturing, and surface details
- Special topics in character animation and visual effects
- Integrating effects with live actors

Project: Final Animation Project (Week 3 of 3): Finish the final animation for turn-in and class critique during the final class meeting.

Week 16 – Final – Tuesday, December 16, 8-10am, OHE 540

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