



DES 213: 3D Digital Tools for Design

Units: 2

Fall 2019

Thursdays 12:00-2:40

Location: HAR 112D

Instructor: Lance Winkel

Office: OHE 530 H

Office Hours:

Mondays 8am-10am, 12-2pm, OHE 530 H

Wednesdays 8am-10am, 12-2pm, OHE 530 H

Thursdays By Appointment Only, at Roski

Contact Info:

winkel@usc.edu

Teaching Assistant:

Office: Physical or virtual address

Office Hours:

Contact Info: Email, phone number (office, cell), Skype, etc.

IT Help: Group to contact for technological services, if applicable.

Hours of Service: Mon-Friday 9am-5pm

Contact Info:

<https://roski.wufoo.com/forms/it-support-form/>

<http://tiny.cc/ipjlbz>



Course Description

An expanded version of the description published in the University catalogue. Describe the student audience for whom the course is appropriate. Aspirational statements are not learning objectives, but are valuable and belong in this section.

Learning Objectives and Outcomes

Identify what specific, measurable skills a student will obtain and be able to demonstrate by the end of the course. Learning objectives should be both taught and assessed in your course. They are aligned with your assignments, assessments and learning materials.

Prerequisite(s): course(s) that must be taken prior to this course

Co-Requisite(s): course(s) that must be taken prior to or simultaneously

Concurrent Enrollment: course(s) that must be taken simultaneously

Recommended Preparation: course work or background that is advisable, not mandatory

Course Notes

Grading Type, if other than the assumed letter grade (i.e., Credit No-Credit or Numeric and/or In Progress). Note any unique characteristics of the course or operating procedure. Is the course Web-Enhanced (i.e. Blackboard), Blended or Online? If copies of lecture slides and other class information will be posted on Blackboard, note that here. If multimedia or technology-enhanced learning strategies will be used, please describe them here.

Technological Proficiency and Hardware/Software Required

If applicable, provide details of accessing course if not in a traditional classroom setting.

Required Readings and Supplementary Materials

Required readings and supplementary materials. Where to access/purchase.

Description and Assessment of Assignments

What kind of work is to be done and how should it be completed, i.e. how the learning outcome will be assessed. Include any assessment and grading rubrics to be used.

Grading Breakdown

Including the above detailed assignments, how will students be graded overall? **Participation should be no more than 15%**, unless justified for a higher amount. All must total 100%.

Assignment	Points	% of Grade
Rock Lego Scissors (Model Tryptich)	20	10
Container	20	10
Wearable	20	10
The One Ring	20	10
Wearable	20	10
Lasercutting Mandala	20	10
Final Project	60	30
Participation	20	10
TOTAL	200	100

Grading Scale (Example)

Course final grades will be determined using the following scale

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Assignment Rubrics

Include assignment rubrics to be used, if any.

Assignment Submission Policy

Describe how, and when, assignments are to be submitted.

Grading Timeline

Announce a standard timeline for grading and feedback.

Additional Policies

Add any additional policies that students should be aware of: late assignments, missed classes, attendance expectations, use of technology in the classroom, etc.

Course Schedule: A Weekly Breakdown

Week 1

August 29

Content:

- Introductions and Course Expectations
- Maya's Graphical User Interface
- Setting up a scene, system preferences, and working units
- Objects vs. Components

Class Setup:

- Download Maya 2018: <http://www.autodesk.com/solutions/mac-compatible-software>
- Download and Install Maya 2018 Service Pack 6
- Download Meshmixer: <http://www.meshmixer.com/download.html>
- Download Meshlab: <http://meshlab.sourceforge.net>
- Download Formlabs's Preform: <https://formlabs.com/software/#preform>
- Get a 3-button mouse!

Reading:

- Chapter 1+2 + 4 Maya Essential Training:
- <https://www.lynda.com/Maya-tutorials/Overview-Maya-interface/604210/644533-4.html>
- <https://www.lynda.com/Maya-tutorials/Select-objects/604210/644541-4.html>
- <https://www.lynda.com/Maya-tutorials/Work-Outliner/604210/644551-4.html>

Homework:

Rock Lego Scissors:

Design and model three unique objects in Autodesk Maya. Each of the models will present a unique and specific modeling challenge:

1. An Asymmetrical Rock or Gemstone. This model will challenge you to create a form that is irregular. Reference types of geodes, strata, crystals, stones, or other natural forms and try to emulate those into this model. For stones that possess some inherent symmetry, explore a solution that allows for asymmetry, such as a geode when it is cracked open.
2. A Custom Lego. This model will conform to and adhere to the Lego Specification, which is a strictly defined and existing specification. The Lego should interface with the Lego Specification at three surfaces.
3. A Multipart Object. This model will feature at least two shells that need to fit together in some way, just like a scissors has a hinge where the two wings of the scissors connect and pivot.

Week 2

September 5

Content:

- Preparing a polygon model for 3D printing
- The importance of hollowness in 3D printing
- The importance of thickness in 3D printing (2-4mm walls for strength)
- Troubleshooting and Cleanup Techniques for 3D Printing
- Two-manifold vs. Non-manifold geometry
- Air-tight geometry

- Boolean Operations
- Previewing how a model will look when printed. (Hotkey = 1, Mesh Display = Harden)
- Review and critique of Custom Lego designs to examine how they conform to the Lego Specification and possible solutions for problematic areas.

Reading:

- Troubleshooting and Cleanup Techniques for 3D Printing and Design
- Chapter 4 Maya Essential Training: Creating Polygonal Models
- <https://www.lynda.com/Maya-tutorials/differences-between-NURBS-polygons/432363/514736-4.html>

Homework:

Custom Lego 3D Printable:

Make changes and final adjustments based on in-class critique of Custom Lego parts. Use polygon operations like Boolean to additively and subtractively combine the various objects into a single unified two-manifold air-tight polygon. Export to STL or OBJ file and test the file for 3D printing and scale in PreForm. Then print the file in the Galen lab. **I am also working to secure a budget to 3D print these Lego's in SLA using Formlabs printers.**

Week 3

September 12

Content:

- Overview of NURBS Geometry
- The relationship between NURBS Geometry and the CAD BREP data structure
- Modeling NURBS Curves and Surfaces
- Leveraging construction history and NURBS operations to simulate traditional techniques. Simulating wrought iron, extrusion, and other complex techniques
- NURBS to Polygon Workflows (Quads, General Fit, Per Span U, Per Span V)
- NURBS Text, and NURBS to Polygon Workflows for Text
- Sculpt Geometry Tools
- Creating a size index for a 3D printing vendor using Maya's Bounding Box data.

Reading:

- Chapter 6 Maya Essential Training: NURBS Modeling Techniques
- <https://www.lynda.com/Maya-tutorials/Introducing-NURBS-modeling-editing/432363/514767-4.html>
- Chapter 7 Maya Essential Training: NURBS Modeling Techniques
- <https://www.lynda.com/Maya-tutorials/Use-isoparms-refine-NURBS-surfaces/432363/514776-4.html>

Homework:

Sacred Vessel, Vase, Container, Ossuary:

Design and create an object that can serve as vessel to hold a plant, flower, or other living form. Begin by creating and manipulating NURBS Curves to define the major shapes, profiles, and other contours. Use NURBS Surfacing tools to make surfaces from those curves. Use NURB to Polygon Workflow to finally transform the NURBS Surfaces into Polygons. Make sure to convert at a high enough number of subdivisions to maintain roundness where roundness is necessary. As Polygons you can apply any and all polygon techniques.

Week 4

September 19

Content:

Reading:

- Chapter 3: Organizing the Maya Scene
- <https://www.lynda.com/Maya-tutorials/Work-Outliner/432363/514727-4.html>

Homework:

Based on in-class critique, amend and make final changes to the design. Then when complete, follow the techniques described earlier to generate a solid, airtight, two-manifold polygon. Print the model on the Makerbots in the Galen Lab

Week 5

September 26

Content:

- Precision Measurement (Calibers, Contour Gauges, and other Techniques)
- Ring sizing
- Preparing Maya scenes and geometry for 3d printing.
- Extrude, three types of smoothing, and deformers more polygonal operations and manipulation.
- 3d type& orthography
- Typography in Maya and orthographic projections
- Using vector graphics to make an object.
- Cleanup and Meshlab

Reading:

- Chapter 5 Maya Essential Training: Editing Meshes
- <https://www.lynda.com/Maya-tutorials/Setting-up-reference/432363/514744-4.html>
- Chapter 7 Maya Essential Training: Sculpt Meshes
- <https://www.lynda.com/Maya-tutorials/Understanding-brush-interface/432363/514764-4.html>

Homework:

Ring Design:

Design a Ring. Incorporate some form of pattern, ornamentation, logo, text, or curse from Mordor into the band. Print it on the Makerbot in the Galen lab. **I am also working to secure a budget to 3D print these Lego's in SLA using Formlabs printers.**

Week 6

October 3

Content:

- Exporting files
- Working with Shapeways and other vendors
- Understanding post-processing techniques in conjunction with 3D printing
- Casting and mold-making

Reading:

- <https://www.lynda.com/Dimension-tutorials/Bring-your-3D-design-ideas-life/789025/807268-4.html>

Homework:

Ring Design to Casting:

Refine ring design and send to Shapeways. Critique the plastic 3D printed rings, prepare files for print to Shapeways. HW: Finalize print and Submit to Shapeways.

Week 7

October 10

Content:

- In-class critique of Rings
- Talk about wearable designs
- Introduction to Fusion 360
- The difference between CAD workflows and traditional Modeling workflows.
- Sketches and Drawing
- History and workflow in Fusion 360

Reading:

Homework:

Wearable:

Design a unique wearable device, apparel, or accessory. Research the use and physical experience of the wearer interacting with or incorporating the device, how they put it on, take it off, how is it restrictive or ergonomic.

Week 8

October 17

Holiday – No class

Week 9

October 24

Content:

- Design Critique and Studio Work
- Topics based on project needs
- More CAD production techniques
- Tollerances for multipart models

Reading:

Homework:

Finalize Wearable

Week 10

October 31

Content:

- Illustrator and Corel
- Document Setup for laser cutters and engraving
- Laser cutting
- Laser engraving and etching
- Various materials
- Limitations of engraving
- Thermal hazards

Reading:

- Tutorials for Illustrator and Corel on Linda.com

Homework:

Lasercut Mandala:

Week 11

November 7

Content:

- Design Critique and Studio Work
- Topics based on project needs
- Interoperability of software tools
- Integrations with digital sculpture tools like ZBrush and Modbox

Reading:

- Slides on Blackboard

Homework:

Begin initial concept work and research for final project:

Week 12

November 14

Content:

- Design Critique and Studio Work
- Topics based on project needs
- Printing largers structure
- Connectors, Busses, and Supports

Reading:

- Slides on Blackboard

Homework:

Formalize concept for final project based on class feedback and critique.

Week 13

November 21

Content:

- Design Critique and Studio Work
- Topics based on project needs
- Lighting and texturing
- Rendering clean final project Renders

Reading:

- Slides on Blackboard

Homework:

Production of final project

Week 14

November 25

Thanksgiving – No class

Week 15

December 5

Content:

- Final Design Critiques and Assembly
- Digital Photography of Print Work

Reading:

- Slides on Blackboard

Homework:

Photograph any final work that is complete. Prepare remainder of Final Project for display and critique during Final Exam Session, Tuesday, December 17, 11 a.m.-1 p.m.

Final Project:

Due for critique during Final Exam Session Tuesday, December 17, 11 a.m.-1 p.m.

Details will be posted on Blackboard.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.