USC Iovine and Young Academy
Arts, Technology and the Business of Innovation

ACAD 187 - Digital Toolbox: 3D Design

Units: 2.0
Fall 2023–Thursday–9:00am-11:50am PT
Location: IYH, Room 210

Instructor: Yihyun Lim, Jacob Patapoff, Emanuel Alvarez, Jose Carillo-Contreras
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Office Hours: By appointment
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IT Help: https://uscedu.sharepoint.com/sites/IYAStudent/SitePages/IT-Resources.aspx
Hours of Service: 8:30am - 6:30pm
Contact Info: iyahelp@usc.edu

Course Description

ACAD 187 - Digital Toolbox: 3D Design will teach students the basics of 3D modeling, 3d printing, 3D scanning, motion capture, as well as the pipeline for importing 3D assets into interactive applications. This class will focus on elemental skills, concepts, and problem solving methods in these programs and challenge students to apply these building blocks creatively in a variety of increasingly sophisticated and innovative design solutions. Software instruction will include Blender, Adobe Aero, Adobe Illustrator, and other related softwares. Output methods will include rendered still images, plastic 3D prints, and interactive software experiences.

Learning Objectives and Outcomes

1. Fundamental understanding of working with 3D modeling software and fabrication tools.
2. Experimentation with concepts related to product design and virtual construction.
3. Proficiency in output of 3D imagery and 3D modeled assets for both physical and virtual environments.

Refer to the Course Notes section below for detailed learning objectives.

Prerequisite(s): none

Co-Requisite(s): none

Recommended Preparation: Purchase a short-term license of Adobe Creative Cloud as Illustrator and Photoshop. Sign up for Blender, Adobe Aero and Mixamo account and other mentioned apps in the sections below.

Course Notes

The class will be a mix of technical demonstrations, software workshop exercises, as well as collective critique sessions. It is crucial for students to attend in order to succeed. The demonstrations, lectures and Information given in class may not be imparted concisely through handouts, classmates or notes. Students are responsible for all readings, assignments, including homework, in-class work, lectures, and presentations. Technical demonstrations may be recorded and shared with the students afterward for further review. Lecture materials will be made available on Blackboard. This class is broken into four modules with specific learning objectives as described below:

Module 1: From 3D to 2D prototyping with laser cutter

- Learn to translate 3D objects to 2D drawings
- Learn to create 3D objects from 2D materials
- Learn to use Adobe Illustrator with the intention of laser cutting
- Learn to prepare a laser cut file and operate laser cutter

Module 2: From 3D Scanning to 3D Printing

- Learn to create 3D scan of an object using 3D photogrammetry and scanning on mobile device
- Learn basics of structured-light scanning using XR Studio
- Learn to use 3D scan file (mesh file) as a base to create a scaled model in Blender
- Learn to prepare digital files for 3D printing
- Learn to operate 3D printer

Module 3: Capturing motion for virtual interactions

- Learn to 3D scan human body and capture motion using mobile applications and XR Studio tools.
- Learn to map motion to 3D assets in virtual environment

Module 4: Creating Virtual Environment and Augmenting the Physical

- Learn to use assets from digital library to construct virtual environments
- Learn to develop AR overlay using Adobe Aero
- Learn to create phygital experience by mapping virtual experiences in the physical

Technological Proficiency and Hardware/Software Required

Students must provide their own laptop. The laptop specifications take into consideration that students will be creating and storing large multimedia files.

- Laptop computer with authorized installations of the following software:
  - Adobe Photoshop CC
  - Adobe Illustrator CC
  - Adobe Aero CC
  - Blender (https://www.blender.org/)
  - Unity (https://unity.com/)
- Adobe Mixamo (https://www.mixamo.com/)
- Mobile/Tablet apps
  - Adobe Aero
  - Scaniverse (https://scaniverse.com/)
  - Polycam (https://poly.cam/)
  - Move.ai (https://www.move.ai/)
  - Plask.ai (https://motion.plask.ai/)
- Three-button mouse (highly recommended).

USC Technology Support Links:
Zoom information for students, Blackboard help for students, Software available to USC Campus.

HOW TO PURCHASE SOFTWARE AT THE DISCOUNTED ACADEMY RATE

The following software are available for purchase online at the Iovine and Young Academy discounted rate:

Software	**IYA Short-Term License at USC Bookstore**
Adobe Creative Cloud	$70 2023–2024 annual license (active through July 2023)
Apple Logic Pro	$35 semester licenses
SolidWorks	$35 semester license
Apple Final Cut Pro	$35 semester license

To purchase:

- Visit: https://commerce.cashnet.com/IOVINE
- Select the software license(s) you would like to purchase by clicking “View Details” or the software title, and make your purchase.
- You will receive an order confirmation receipt at the email address you provided.
- You will be notified by email when the software license has been activated.

If you have any questions about this process, please do not hesitate to contact Academy IT Support at iyahelp@usc.edu.

Description and Assessment of Assignments

The following is a breakdown of the assignment expectations. All projects are to be performed in teams. You’re expected to help each other out and share your skill sets. Unless otherwise noted, submit all of your digital assets (project files, exported application, models, textures, etc) in a ZIP file via blackboard. Both process and outputs from each project need to be documented in blog format and uploaded to the course blog site (https://sites.usc.edu/ACAD187). One post for each team is required. Each project in ACAD187 requires each of the following to be completed:

1. **Project #1: 2D laser cutting and garment making (15%)**
    - Create a scaled 2D drawing of the provided mannequin in Rhino3D/Illustrator, annotate drawing with measurements
    - Generate ideas for a garment (for the mannequin), and have ideas approved during classLaser cut flexible material (fabric, paper, etc) and complete the garment for the mannequin
    - Documentation of the process and presentation of the finished product for the mannequin. Include process photos, screenshots, sketches, and final output (blog post)
    - Present the design and process to class.

3. **Checkpoint #1: 3D Scanning (5%)**
    - Mobile 3D Scanning: scan the objects you proposed and have it approved during checkpoint #2.

4. Checkpoint #2: Blender (5%)
    - Scale and modify the details of the scanned objects using Blender. Each person on the team should work on a modified design, and one person should assemble all 3D models into one file for review during checkpoint #3.

5. Project 2: 3D Printing and fitting the mannequin (10%)
    - 3D scanning and Blender based modeling project. Create a 3D model of the object you proposed by 3D scanning the object (approved in checkpoint 2). Print the object on one of the 3D printers to be presented in class on the due date. The object needs to be scaled to fit the mannequin.
    - Create a blog post that documents the entire process (from 3D scanning, Blender design, and 3D printing), by including screenshots, process photos, and final output. Include screenshots of your 3D object in Rhino from the front, top, side, and perspective views.
    - Present the design and process to class.

6. Project 3: Capturing and Mapping Motion (15%)

- Capture human motion by using assigned softwares and tools.
- Map selected motion to a virtual mannequin
- Create a blog post that documents the entire process, and present in class
- Further details of the project will be provided in class

7. Project 4: Creating AR Experience (15%)

- Create a virtual 3D environment using Adobe Aero/Unity
- Create AR overlay (overlay of motion, 3D object, 3D space, bringing digital to physical)
- Create a blog post that documents the entire process, and present in class
- Further details of the project will be provided in class

9. Final Project: Phygital Shopping Experience

- Working as a group, develop a virtual shop using Unity 3D utilizing assets you have modeled in Blender. Your models should utilize materials and textures that were created in Photoshop and applied in Unity. Your virtual shop must incorporate interaction allowing the user to move their view or character around using the mouse and keyboard.
- The shop should also have a physical component, where the user can use a mobile phone to overlay virtual items (variations of the physical design) onto a physical mannequin.
- Further details of the project will be provided in class.

Grading

Assignment	Points	% of Grade
Project 1: Laser cutting and garment making	150	15%
Checkpoint 1: 3D scanning	50	5%
Checkpoint 2: Blender - 4 design options	50	5%
Project 2 - 3D Modeling and 3D Printing	100	10%
Project 3 - Capturing and Mapping Motion	150	15%
Project 4 - Creating AR Experience	150	15%
Final Project - proposal	50	5%
Final Project - Presentation and Demo	200	20%
Participation and Teamwork	100	100%
Total	**1,000**	**100%**

Assignment Submission Policy

Assignments must be delivered, per instructor guidelines, by 9 am. Pacific Time on the date that deliverable is listed as due. Early submissions are, of course, encouraged.

All assignments must be completed in order to pass this class.

Late work

Assignments will be accepted after the deadline with the following grade penalties. Do not ask for extensions.

- Submission in the 24 hours after the deadline 10% deduction
- Submission between 24 and 48 hours after the deadline 20% deduction
- Submission between 48 hours and 3 days after the deadline 50% deduction
- Submission more than 3 days after the deadline 100% deduction

Keep copies of all your files and emails until the end of the semester.

Grading Timeline

Grades will be shared within, or less than, a 2-3-week time period. You are encouraged to check in with your instructor at any time to better understand your standing in the course.

Correcting a Grading Error or Disputing a Grade

If you don't inform the instructor of missing or incorrect grades within two weeks of those grades being posted, the grades will be assumed correct. Do not wait until the semester's end to check or appeal any grades. If you feel a grade merits re-evaluation, you are encouraged, within one week of the instructor providing a grade and initial feedback, to send the instructor a memo in which you request reconsideration. The memo should include a thoughtful and professional explanation of your concerns. Be aware that the re-evaluation process can result in three types of grade adjustments: positive, none, or negative. (Note: Complaints on the date of a graded assignment's return to you will not be addressed; it is essential to wait one full day prior to raising a concern.)

Class Attendance Policy

The Academy maintains rigorous academic standards for its students and on-time attendance at all class meetings is expected. Each student will be allowed two excused absences over the course of the semester for which no explanation is required. Students are admonished to not waste excused absences on non-critical issues, and to use them carefully for illness or other issues that may arise unexpectedly. Except in the case of prolonged illness or other serious issue (see below), no additional absences will be excused. Each unexcused absence will result in the lowering of the final grade by ⅓ of a grade (e.g., an A will be lowered to A-, and A- will be lowered to a B+, etc.). In addition, being tardy to class will count as one-third of an absence. Three tardies will equal a full course absence.

Students remain responsible for any missed work from excused or unexcused absences. Immediately following an absence, students should contact the instructor to obtain missed assignments or lecture notes and to confirm new deadlines or due dates. Extensions or other accommodations are at the discretion of the instructor.

Automatically excused absences normally may not be used for quiz, exam or presentation days. Using an excused absence for a quiz, exam or presentation, such as in the case of sudden illness or other emergency, is at the discretion of the instructor.

In the case of prolonged illness, family emergencies, or other unforeseen serious issues, the student should contact the instructor to arrange for accommodation. Accommodation may also be made for essential professional or career-related events or opportunities. Additionally, students who need accommodations for religious observations should provide advanced notice to instructors and student athletes should provide Travel Request

Letters. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.

Students and Disability Accommodations:
USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Iovine and Young Hall Cleanout

The Academy is unable to store student projects and materials beyond the end of the semester. Students must remove all projects and personal materials from the Creators Studio, lockers/locker room, and other classrooms by the end of each semester. All projects and materials left in Iovine and Young Hall will be discarded two days after final exams end. No exceptions.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. (Living our Unifying Values: The USC Student Handbook, page 13).

USC Learning Experience Evaluations

USC Learning Experience Evaluations otherwise known as course evaluations occurs at the end of the semester university-wide. It is an important review of students' experience in the class. The process and intent of the end-of-semester evaluation should be provided.

Weekly Class Schedule

*Please cross-reference with the Assignments section of the syllabus for greater details on deliverables.

Wk	Workshop Topics and Activities	Deliverables
1 8/24	● Introduction ● Course/Syllabus overview ● **Introduction to Module 1** ● Creator Studio Training / In-class work time	
2 8/31	● Create inspiration board for laser cut fashion ● Creator Studio Training / In-class work time	Complete Creator Studio Training by end of Week 2
3 9/7	● **Module 1 Workshop Session with Jacob P - Rapid prototyping with Laser Cutter (in Room 210)** ● Laser cutter demo in Creator Studio ● Studio time	
4 9/14	● **Team Presentation of Module 1 Assignment** ● **Module 2: From 3D Scanning to 3D Printing** ● **Workshop Part 1: 3D scanning of simple object (using phone/ipad) with Jacob Patapoff**	**Project #1 Due** **-** Presentation in class - Create blog post on course website, due by class time - Each student to bring small object with interesting details (product for the mannequin) for 3D scanning
5 9/21	● **Module 2 Workshop, Part 2 - 3D prototyping using Blender (led by Emanuel Alvarez)** ● Studio time and Checkpoint #1	**- Checkpoint #1** due in class: Complete 3D scanning of your selected object using mobile app, and import file into Blender for review.
6 9/28	● **Module 2 Workshop, Part 3 - 3D Printing (led by Jacob Patapoff)** ● Studio time and Checkpoint #2	**- Checkpoint #2** due in class: Each team to prepare 3-4 design options in Blender - Teams to assemble all 3D design files into one 3D printable file.
7 10/5	● **Team Presentation of Module 2 Assignment** ● **Module 3 - Capturing motion for virtual interactions (led by Emanuel Alvarez)** ○ Demo of Mixamo - mapping existing details	**- Project #2 Due: 3D Prototyping** - Student teams to prepare blog post documenting 3D scanning process, Blender, and 3D printing of the object. - Present using the blogpost and also bring the 3D printed object fitted on the mannequin

Wk	Workshop Topics and Activities	Deliverables
8 10/12	**USC Fall Recess, no class**	
9 10/19	● **Module 3 continued: Capturing motion for virtual interactions in XR Studio (led by Emanuel Alvarez)** ○ Demo of full-scale motion capture in XR Studio ● Studio time	- Teams to book XR Studio time to use motion capture device/software, to complete Project 3 assignment
10 10/26	● **Team Presentation of Module 3 Assignment** ● **Module 4, Part 1: Creating Virtual Environment in Aero (led by Emanuel Alvarez)** ● Creating virtual environment (Importing Blender files from previous assignment, utilizing library to import objects, furniture, etc)	**- Project 3 Due: Capturing and Mapping Motion (on Mannequin)**
11 11/2	● Module 4, Part 2: **Creating AR Experience in Aero (led by Jose Carillo)** ○ Learn to use Adobe Aero to create AR overlay (overlay of motion, 3D object, 3D space, bringing digital to physical)	
12 11/9	● **Project 4 Presentation** ● **Final Project Intro: Phygital Shopping Experience** ● Students to create their own final project teams ● Teams to work on Phygital Store experience proposal	**- Project 4 Due: Creating AR experience**
13 11/16	● Studio time ○ 3D Scanning and 3D Printing Q&A with Jacob ○ Unity and Blender Q&A with Eman ○ AR Q&A with Jose	**Final Project checkpoint:** Proposal for phygital store experience due
14 11/23	**Thanksgiving Holiday, No class**	
15 11/30	● Studio time ● 3D Scanning/Printing Q&A Session with Jacob ● Unity and Blender Q&A Session with Eman ● AR Q&A Session with Jose	
12/7	**Final Project Demo and Final presentation during Final Exam Date: December 7th, 11am - 1pm**	

Statement on Academic Conduct and Support Systems

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the USC Student Handbook. All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Policy for the use of AI Generators

You should never attempt to present or include content created by others, including generative AI as your own. Attempting to take credit for content generated by AI or others without proper acknowledgement is a violation of USC's policies and standards for academic integrity and can result in disciplinary action.

As with including other sources in your research and assignments, it is critical to include proper citations and attributions when incorporating content created by generative AI. Visit the Citing Generative AI section on USC Libraries Research Guides website more details on how to cite Generative AI using common writing styles and formats.

Although critical evaluation of sources is a core component of research and academic work, it is especially important when working with generative AI. Content generated by AI should always be evaluated for its accuracy and credibility using critical thinking and additional, credible sources. Many large language models & text-based generators create content that appears accurate and may even include sources, some of which may not actually exist.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.
988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.
Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
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
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) 442-1200 – 24/7 on call
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.