



ITP 308 – Computer-Aided Design for Bio-Mechanical Systems

Units: 3

Spring 2025—MW—12:30-1:50 AM

Location: WPH 107

Instructor: James Yoo

Office: DRB B8

Office Hours: MW 2-3 PM

Contact Info: james.yoo@usc.edu

Graders: Maria Elena Moscaira Morales, Austin Newburry

IT Help: Provided by Viterbi IT

Hours of Service: 8am–5pm M-F, DRB 205 (walk-in)

Contact Info: engrhelp@usc.edu, (213) 740-0517

Course Description

This course covers concepts of computer-aided design (CAD) in 2- and 3-dimensions. Students will model advanced parts using sketches, extrusions, and surfaces. They will also form assemblies and sub-assemblies for motion analysis. Students will communicate technical design through drawings and animation.

Learning Objectives

This course will introduce students to one of the most widely used CAD programs today: SolidWorks. We will cover topics such as sketching, part assembly, drawings, motion tools, and finite element analysis, preparing students for the Certified SolidWorks Associate (CSWA) certification.

Objectives:

1. Utilize the solid modeling package SolidWorks to design complex parts and assemblies for manufacturing and production.
2. Analyze designs using a Finite Element Analysis simulation for stress analysis and design optimization
3. Work collaboratively and efficiently in a group setting to design and analyze a complex physical system
4. Utilize modeling and design principles to satisfy functional requirements in creative and novel ways
5. Communicate designs and findings through proposal writing and presentations

Prerequisite(s): none

Co-Requisite(s): none

Concurrent Enrollment: none

Recommended Preparation: MATH 245 and some strength of materials knowledge

Course Notes

All lecture slides, recorded lectures, homework, and lab assignments will be posted to the course Brightspace page.

Technological Proficiency and Hardware/Software Required

Students are expected to be able to perform the following tasks before the course begins:

- Create a ZIP file that contains one or more files
- Unzip a file that contains one or more files
- Submit files through Brightspace's submission page

SolidWorks version 2020 or higher is required. Students can access SolidWorks in the following ways:

1. Request a loaner laptop (PC) from ITP to borrow for the duration of the semester. It will come preloaded with SolidWorks 2020. You will be shipped a laptop if you cannot physically pick it up from the ITP office (all shipping fees will be paid for by ITP). More details here: <https://itp.usc.edu/current-students/itp-device-check-outs/>
2. Accessing the Virtual Desktop Interface (VDI). You can use a virtual machine that has SolidWorks installed on it through your web-browser or through an application you install on your computer. This connection requires a stable internet connection. This method works on Mac and Windows. More details here: <https://viterbiit.usc.edu/instructional-support/viterbi-mydesktop-vdi/>

Lectures will be recorded via [Zoom](#) and posted to [Brightspace](#). Other software for completing assignments can be found here: <https://software.usc.edu/>.

Optional Readings and Supplementary Materials

Lectures will cover what is necessary to complete assignments, but the following optional texts are highly recommended for better proficiency with SolidWorks. Electronic copies of both books are available for free through the USC Libraries search.

Mastering SolidWorks, by Matt Lombard

Introduction to SolidWorks: A Comprehensive Guide with Applications in 3D Printing, by Godfrey C. Onwubolu

Description and Assessment of Assignments

Homework and lab work will be assigned weekly to assess learning from both lectures and readings.

Grading Breakdown

The final grade will be composed of the following:

Table 1: Grading Breakdown

Assessment Tool (assignments)	% of Grade
Lab	25
Homework	20
Midterm project	25
Final project	30
TOTAL	100

Grading Scale

Course final grades will be determined using the following scale:

Table 2: Course Grading Scale

Letter grade	Corresponding numerical point range
A	93
A-	90-92
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

Midterm Project

The midterm project will be an individual modeling project that will have a set of requirements and will test all the material learned from the first 7 weeks of the semester. It will be worth 25% of the overall grade.

Requirements:

Students will create a project based around functional requirements given by the instructor in Week 3. It must make use of at least 1 assembly comprised of at least 3 parts. The assembly must be constrained to physical limitations and mated properly. Students must also present technical drawings of all parts and assemblies. For each assembly drawing, there should be a BOM and an exploded view showing how the parts are assembled. Students will give a short presentation on their project during class.

Students must show that their project meets the functional requirements set forth by the instructions. Grading will be based on the following distribution:

Total points: 100

- 10 points – Meets Functional Requirements
- 50 points – Parts and Assembly files
- 20 points – Presentation
- 20 points – Technical Drawings

Final Project

The final project will be a cumulative project that requires the use of learned material during the semester. The project will be worth 30% of the overall grade and can be done in a group of up to 3 members.

Requirements:

A group of up to 3 students will create an assembly of their choice. The assembly must feature at least 4 different parts per student, with an average of 8 different features (cuts, extrusions, surfaces, etc.) for each part. The assembly must be completely constrained with physical limitations accounted for (colliding parts, over-rotation, etc.).

Each group must submit a proposal that outlines their final project along with a list of parts that make up the assembly. Preliminary sketches or photographs must be provided as well as any supporting documentation for your build.

Each group will create a photo-realistic render of the assembly and create an animation of the assembly. Final projects will be presented during the assigned final exam time, including a discussion of the design process along with any analyses that were conducted.

Anonymous peer evaluations will be submitted as well as evaluations of your project made by the other groups. Each will be taken into consideration when calculating the final project grade.

Total points: 100

20 Points – Proposal

20 Points – Presentation

50 Points – Assembly and Part Files

10 points – Evaluations

Assignment Submission Policy

Homework and lab assignments will be given weekly. Students will submit all their homework and lab assignments through Brightspace only. No email submissions will be counted towards a student's grade. Late work will be accepted up to two days after the due date of the assignment or lab.

0 – 24 hours Late: 80% maximum credit

24 – 48 hours Late: 65% maximum credit

>48 hours late: 0% maximum credit.

Late passes

One late pass is worth an extra 24 hours to submit an assignment without penalty. Every student will start with 2 passes and can choose to use 1 at a time or both at once. Passes cannot be used for the midterm project and final project.

Grading Timeline

Grading of assignments will be done within one week of the deadline.

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).

Course Schedule

The course schedule below lists topics as well as recommended readings and assignments for each week.

Table 3: Course schedule

	Topics	Readings	Assignments
Week 1	SolidWorks interface; basic sketching	Onwubolu ch. 1-2	Lab1: Sketching HW1: Basic Extrusions
Week 2	Basic features, patterns; reference geometry	Onwubolu ch. 3	Lab2: Symmetry and Patterns HW2: Functional Design
Week 3	Basic assemblies; exploded view	Onwubolu pp. 245- 249, ch. 8	Lab3: Joint Assembly HW3: Reference Geometry Midterm Project Assigned
Week 4	Design intent; equations; configurations	Lombard ch. 10-11	Midterm Project check-in
Week 5	Drawings; section views; annotations; BOM	Onwubolu ch. 9	Lab4: Drawing Views HW4: Creation from Drawing
Week 6	Dimensions; tolerances		HW5: GD&T
Week 7	Advanced sketching	Lombard ch. 6	Lab5: 3D Sketching Final Project Assigned
Week 8	CSWA practice		Lab6: CSWA Practice Part HW6: CSWA Practice Assembly Final Project Proposal Due
Week 9	Midterm Project Presentations		Midterm Project Due
Week 10	Advanced features	Onwubolu ch. 6	Lab7: Lofting Bodies HW7: Advanced Part Creation
Week 11	Simulation Xpress; simulation of loads; FOS	Onwubolu ch. 34	Lab8: Simple Load Analysis HW8: Functional Design
Week 12	Assembly features; component patterns; advanced mates	Lombard ch. 14-15	HW9: Advanced Assembly Creation
Week 13	Surfaces	Lombard ch. 32	Work on Final Project
Week 14	Motion; animation; rendering	Lombard ch. 23 Onwubolu ch. 16	Work on Final Project
Week 15	Decals; material properties		Work on Final Project
FINAL			Refer to the final exam schedule in the USC <i>Schedule of Classes</i> at classes.usc.edu .

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.

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.

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.