

Fall Term
Undergraduate & Graduate Levels
4.500/4.505

Design Computation: Art, Objects & Space

Prof. Larry Sass
Lecture Tuesday 9:00-10:30 AM
Lab - Wednesday or Thursday, 9:00-10:30 AM
(2-2-8) Credits
Room 1-150 & 1-134

Introduction

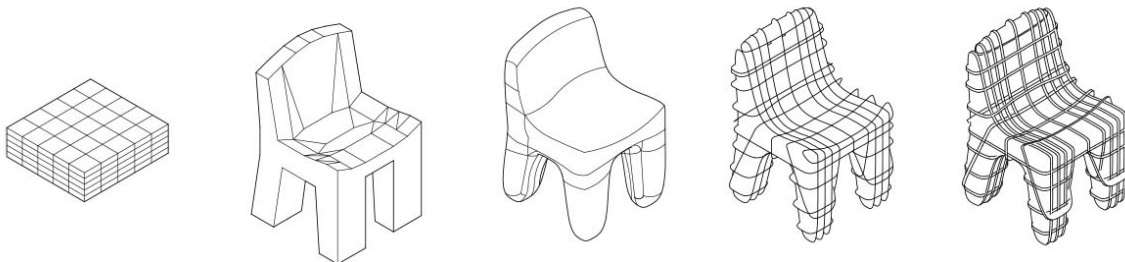
This class will introduce course four majors, minors, and graduate students to the creative ways we use geometric modeling and output as part of design processing. We explore various foundational technologies weekly; this includes 3D Modeling, Computer Generated Rendering, and Computer-Generated Animation. First, we will learn established design principles and methods professional designers use to explore ideas and build projects. Although the medium for the course is centered on computer modeling, the application is guided by weekly design exercises, student presentations, and instructor feedback. We will work on two projects throughout the term, starting with a deep product analysis of an existing chair and ending with a proper, well-designed, fabricated chair.

Design, visualization & fabrication

This semester, the class explores the design and fabrication of chairs. Each student will conceptualize and develop an engaging and exciting design for a small chair. The final chair will be assembled with wooden components. Along the way, we will learn how to 3D model our design in detail using digital visualization and prototyping before fabricating the chair at full scale.

Requirements

- Students must complete 11 assignments, participate in class discussions and reviews, and share their design ideas.



Last updated: Sept 19, 2024

Week 0

- [Introduction](#)
 - Lab 1: Wednesday, Sept 4 (Room-1-134)
 - Lab 2: Thursday, Sept 5 (Room-1-132)
 - Handout: Assignment 0
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Week 1

- [What is Design?](#)
 - Lecture: Tuesday, Sept 10 (Room 1-150)
 - Due: Assignment 0 - Class Setup
 - Handout: Assignment 1 - Drawing a Chair
 - [Points, Lines & Planes](#)
 - Lab 1: Wednesday, Sept 11 (Room-1-134)
 - Lab 2: Thursday, Sept 12 (Room-1-132)
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Week 2

- [What is Computation?](#)
 - Lecture: Tuesday, Sept 17 (Room 1-150)
 - Due: Assignment 1 - Drawing a Chair
 - Handout: Assignment 2 - Modeling a Chair
 - [Solid Modeling](#)
 - Lab 1: Wednesday, Sept 18 (Room-1-134)
 - Lab 2: Thursday, Sept 19 (Room-1-132)
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Week 3

- [What is Prototyping?](#)
 - Lecture: Tuesday, Sept 24 (Room 1-150)
 - Due: Assignment 2 - Modeling a Chair
 - Handout: Assignment 3 - Printing a Chair
 - [Mesh Modeling](#)
 - Lab 1: Wednesday, Sept 25 (Room-1-134)
 - Lab 2: Thursday, Sept 26 (Room-1-132)
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Week 4

- [What is Visualization?](#)
 - - Lecture: Tuesday, Oct 1 (Room 1-150)
 - Due: Assignment 3 - 3D Printing a Chair
 - Handout: Assignment 4 - Rendering a Chair
 - [Rendering](#)
 - Lab 1: Wednesday, Oct 2 (Room-1-134)
 - Lab 2: Thursday, Oct 3 (Room-1-132)
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Week 5

- [Design Experience & Function](#)
 - Lecture: Tuesday, Oct 8 (Room 1-150)
 - Due: Assignment 4 - Rendering a Chair

- Handout: Assignment 5 - Design Experience & Function
 - [Surface Modeling](#)
 - Lab 1: Wednesday, Oct 9 (Room-1-134)
 - Lab 2: Thursday, Oct 10 (Room-1-132)
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Week - 6

- No Class
 - *No Lecture: Tuesday, Oct 15 (Room 1-150)*
 - Show & Tell /Design Experience & Function
 - Due: Assignment 5 - Design Experience & Function (Model)
 - Handout: Assignment 6 - Design Forming (Rendering)
 - Lab 1: Wednesday, Oct 16 (Room-1-134)
 - Lab 2: Thursday, Oct 17 (Room-1-132)
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Week 7

- [Design Forming](#)
 - Lecture: Tuesday, Oct 22 (*Room 1-150*)
 - Handout: Assignment 7 - Prototyping 1 (Laser Cutting)
 - [Planar Modeling](#)
 - Due: Assignment 6 - Design Forming (Rendering)
 - Lab 1: Wednesday, Oct 23 (Room-1-134)
 - Lab 2: Thursday, Oct 24 (Room-1-132)
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Week 8

- [Design for Fabrication](#)
 - Lecture: Tuesday, Oct 29 (*Room 1-150*)
 - Due: Assignment 7 - Prototyping 1 (Laser Cutting)
 - Handout: Assignment 8 - Assembly Design (CNC)
 - MasterCAM
 - Lab 1: Wednesday, Oct 30 (N51 Woodshop)
 - Lab 2: Thursday, Oct 31 (N51 Woodshop)
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Week 9

- [Manufacturing](#)
 - Lecture: Tuesday, Nov 5 (*Room 1-150*)
 - Handout: Assignment 9 - Prototype 2 (Laser Cutting)
 - [MasterCAM](#)
 - Lab 1: Wednesday, Nov 6 (Room-1-134)
 - Lab 2: Thursday, Nov 7 (Room-1-132)
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Week 10

- No Class
- Show and Tell/Prototype
 - Due: Assignment 8 -Assembly Design (CNC)
 - Due: Assignment 9 - Prototype 2 (Laser Cutting)
 - Handout: Assignment 10 - Shop Drawings (Drawings)
 - Lab 1: Wednesday, Nov 13

- Lab 2: Thursday, Nov 14 (N51 Woodshop)
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Week 11

- [Design Strategy](#)
 - Lecture: Tuesday, Nov 19 (*Room I-150*)
 - Handout: Assignment 11 - Design Final (CNC)
 - Woodshop
 - - Due: Assignment 10 - Cut Sheet Design (Drawings)
 - Lab 1: Wednesday, Nov 20 (N51 Woodshop)
 - Lab 2: Thursday, Nov 21 (N51 Woodshop)
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Week 12

- NO CLASS - Thanksgiving
 - Tuesday, Nov 26
 - NO CLASS - Thanksgiving
 - Thursday, Nov 27
 - NO CLASS - Thanksgiving
 - Thursday, Nov 28
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Week 13

- Woodshop Fabrication
 - No Class - Dec 2-6
 - Monday - Friday
 - 9-6 PM
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Week 14

- Show & Tell
 - Tuesday, Dec 10 (MAD Academy)
 - Due: Assignment 11 - Design Final (CNC)
 - 9-11 AM
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Learning Objectives

You will learn:

- A design process using the computer and machines.
- Three principal modeling techniques (Surface, Solid & Mesh)
- Fundamentals of physical and scalable prototyping
- Fundamentals of CAM (MasterCAM) Software & CNC machining
- Fundamentals of computer rendering both Daylight

Challenges

- This course is tough if you have not completed a design studio
- This course does not teach design in the ways that one learns in studio
- This course is challenging for people with spatial issues when using CAD software.

Instructional Material

Students are expected to learn how to design with computers as a visual and physical production system. We follow stepped processes to solve a design problem through 11 exercises.

Each exercise is one step within a larger design process. With each exercise, students learn a new method of modeling, rendering, or machining. Each week, the class is divided into three steps:

- *Assign a Problem:* The class explores distinct problems related to design analysis, designing an experience, design functioning, design forming, and modulation design.
- *Demonstration:* I demonstrate how to draw, model, render or fabricate with each class.
 - For most assignments, I provide a sample 3D Model for your review.
 - I also demonstrate from start to finish how each assignment will be completed during the lecture.
- *Assignments:* Students are provided with online instructions on Canvas for each assignment.
 - Tools for assignments are presented graphically with steps.
 - Additional methods are also shared through YouTube videos.

The Final Project

The final project will be a chair of interlocking plywood components designed in CAD and manufactured with a computer numerically controlled machine (CNC). Throughout seven assignments, your chair will be designed, prototyped, and evaluated in various ways. The final project also includes a written summary of drawings and renderings uploaded to Canvas.

Time

- Time spent building assignments is not a measure of excellence.
- The course is 12 Units
- 1.5 Hours Lecture
- 1.5 Hours of Lab
- 9 Hour Assignment
- Email me if the assignment is taking more than 5 hours

Attendance

- We meet approximately 22 times within the semester
- All classes are In-Person
- Attendance is taken by emailing an In-Class Assignment to the Professor - lsass@mit.edu before 10:30 AM (Lecture & Lab).
- A maximum of 3 absences allowed - You are allowed three excused absences for the semester. An excused absence is defined as one that was discussed with and approved

by the professor or a family or medical emergency that is confirmed by your physician or a dean in the *Student Support Services*

- Four absences could mean automatic failure
 - THANKSGIVING - No Class Nov 26-29
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Handout

- Assignments are due on Canvas 6-12 (*one to two weeks*) days after they are assigned.
 - Some assignments are physical models that Larry needs to photograph for credit. (personal photos are not accepted).
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Grades

- A graded response is provided 4 - 7 days after the due date.
 - I provide text feedback on most but not all assignments.
 - You are expected to apply responses and corrections to future assignments
 - The range of grades is 50-100. I will give partial credit for turning in an assignment.
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Late Assignments

- Do your best to stay caught up (*making up for missing work is highly stressful*)
 - I do not lower your grade for late assignments.
 - Late assignments are noted as late.
 - Late assignments can affect your final grade.
 - Students who turn in assignments on time will receive a higher grade than those with multiple late assignments.
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Fee

\$120 - collected by Inala Locke four weeks into the semester.

- We will stock and store materials for you.
- This fee will be charged to your MIT Account after the 6 Week.
- This fee entitles you to the following:
 - \$20 -3D Printing Plastic
 - \$15 -3 Masonite Sheets (16" x 31")
 - \$15 -1 Small Plywood board (16" x 31")
 - \$120 -1 Large Plywood board (48" x 96" x1/2")

Total \$170

Grading

- Larry Grades Assignments, not the TAs
 - Everyone Starts with a "B"
 - Grading is based on the quality of your work, not quantity.
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- Exercises 1-10 = 80% of grade
 - Final exercise 11 = 10% of grade
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- Attendance = 10% of grade.
 - Missing classes will count against your final grade
 - 3 Absences amount can result in a deduction of a letter grade

- 4 Absences can result in a failing final grade
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- Late Assignments will be marked and resolved at the end of the term.
 - Multiple late assignments will affect the final grade.
 - Canvas color coats late assignments