Design Computation:
Art, Objects & Space

Prof. Larry Sass
Tuesday & Thursday 9:00-10:30 AM
(2-2-8) Credits
Room 1-150

Course Description & Goals:

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. Weekly design exercises, student presentations, and instructor feedback guide the application. We will work on two projects throughout the term, starting with a deep product analysis and ending with a practical, well-designed physical product – A full-scale chair. Students must complete 10 assignments, participate in class discussions and reviews, and share their design ideas.

Who should take this course?

This course is designed to introduce graduate and undergraduate students to computation through the designer's lens. No prior computer experience is needed. However, design experience is recommended.

Students are expected to complete 10 assignments, participate in class discussions and reviews, and share their design ideas during the final review.
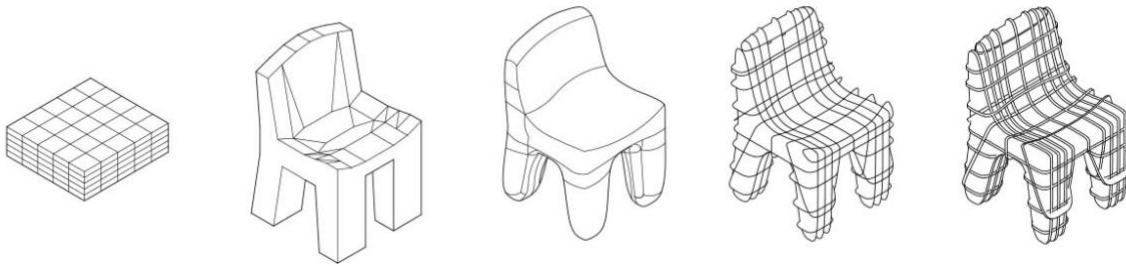
Last updated: Sept 8, 2023

Week 0
Thursday, Sept 7
- Introduction to Design Computation
- Handout: Assignment 0

Week 1
Tuesday, Sept 12
- Lecture: Design
- Due: Assignment 0 - Class Setup
- Handout: Assignment 1 - Drawing a Chair
- Thursday, Sept 14
- Lab: Points, Lines & Planes

Week 2
Tuesday, Sept 19
- Lecture: Design Computation
- Due: Assignment 1 - Drawing a Chair
- Handout: Assignment 2 - Modeling a Chair
- Thursday, Sept 21
- Lab: Solid Modeling

Week 3
Tuesday, Sept 26
- Lecture: Design Prototyping
- Due: Assignment 2 - Modeling a Chair
- Handout: Assignment 3-Printing a Chair
- Thursday, Sept 28
- Lab: Mesh Modeling

Week 4
Tuesday, Oct 3
- Lecture: Visualization
- Due: Assignment 3 - 3D Printing a Chair
- Handout: Assignment 4 - Rendering a Chair
- Thursday, Oct 5
- Lab: Rendering

Week 5
Tuesday, Oct 10
- Holiday - No Class
- Thursday, Oct 12
- Show & Tell
- Due: Assignment 4 - Rendering a Chair
- Handout Assignment 5 - Design Experience

Week - 6
Tuesday, Oct 17
- Lecture: Design Experience
- Thursday, Oct 19
- Lab: Surface Modeling

Week 7
Tuesday, Oct 24
- Lecture: Design Functioning
- Due: Assignment 5-Design Experience
- Handout: Assignment 6 - Design Function
- Thursday, Oct 26
- Show and Tell (Experience & Function)

Week 8
Tuesday, Oct 31
- Design Forming
- Due: Assignment 6 - Design Function
- Handout: Assignment 7 - Design Forming
- Thursday, Nov 2
- Lab: Planar Design

Week 9
Tuesday, Nov 7
- Lecture: Assembly Design (N51-Woodshop)
- Due: Assignment 7 - Design Forming - Planar Model - 1st Pass
- Handout: Assignment 8 - Assembly Design (CNC)
- Thursday, Nov 9
- Lecture: CAD/CAM (classroom)

Week 10
Tuesday, Nov14
- Lecture: Design Synthesis (N51 Woodshop)
- Handout: Assignment 9 Planar Model - 2nd Pass
- Thursday, Nov 16
- Show and Tell (Classroom)
- Exercise 8 is due.

Week 11
Tuesday, Nov 21
- NO CLASS - Thanksgiving
- Thursday, Nov 23
- NO CLASS - Thanksgiving

Week 12
Tuesday, Nov 28
- Show & Tell
- Due: Assignment 9 Planar Model - 2nd Pass
- Handout: Assignment 10 CNC Chair
- Thursday, Dec 1
- NO CLASS

Week 13
Tuesday, Dec 5
- NO CLASS
- Thursday, Dec 7
- Due: Assignment 10 CNC Chair
- Show & Tell

Learning Objectives
You will learn:

- Common design processes using the computer and machines.
- Three principal modeling techniques (Surface, Solid & Mesh)
- Fundamentals of physical and scalable prototyping
- Fundamentals of Computer Rendering with Daylight
- Fundamentals of CAM (masterCAM) Software & CNC machining

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 10 exercises. Each exercise is one step within a more extensive process of design. With each exercise, students learn a new modeling, rendering, or machining method.

Each week, class is divided into three steps:
1. *Assign a Problem:* Design analysis, designing an experience, design functioning, design forming, and modulation design are distinct problems explored at different stages throughout the class.

2. *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 is to be completed during the lecture.
3. *Homework:* 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.

Text
Architectural Graphics by *Francis D K Ching*
https://www.wiley.com/en-us/Architectural+Graphics%2C+6th+Edition-p-9781119035664(Links to an external site.)

Grading is based on
- Everyone Starts with a "B"
- Exercises 1-9
- Final exercise 10
- Attendance & Class Participation

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

Attendance
- We meet approximately 22 times within the semester online only
- 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*
- 4 absences mean automatic failure

- THANKSGIVING - No Class Nov 21 & 23
- We will meet on Monday - Nov 27
- Last Class Thursday, Dec 7 at 9:00 AM

Course 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.
- 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

Canvas
- All assignments are on canvas.
- I often place a demonstration of the assignment online to use as a guide

Laptop Setup (Your computer)
- You will need to use your own laptops for this course
- Best if your computer is less than 4 years old and you will need at least a gig of space for software and images.
- PROCESSOR: core i7 - 4 cores
- HARD DISK: SSD (no old mechanical spinning drive)
- 60GB free space
- RAM: 16GB
- Laptop support – stoa@mit.edu