



Massachusetts Institute of Technology
15.S20 SSIM: Design for 3D Printing
Fall 2020
Course Syllabus V1

CLASS TIMES AND LOCATIONS:

Mondays, 9:30 - 11:00 AM, Online.

UNITS:

6 units (3-0-3)

PRE-REQUISITES:

None. This class is open to any novice designer, engineer, or entrepreneur, undergraduate and/or graduate, from any course of study.

MAXIMUM CLASS SIZE:

Class size is limited to a maximum of 15 students. The class is by application only. If there are more applicants than we can accommodate, we will select the cohort by lottery.

NO LISTENERS:

As this is a hands-on, project-based class, no listeners will be accepted.

OVERVIEW:

Introduction

"**Design for 3D Printing**" (15.S20) provides an extensive overview of Computer-Aided Design (CAD) software including Onshape, Fusion360, SculptGL, and InVesalius and their importance in the additive manufacturing, aka 3D printing, and "maker" industries. Students will get experience using CAD software to design parts for different applications and 3D printers.

Participants will learn and practice the fundamentals of CAD software, then explore opportunistic techniques in designing parts to be manufactured via 3D printing. Each student will design over 5 parts using different software available online or through MIT licenses.

Goals and objectives

The objectives of this class are to introduce students to useful computer-aided design software and “dig deep” into their applications in industry. After this class, students will be confident in designing, 3D printing, and redesigning models for different applications, technologies, and 3D printers. Design constraints from different 3D printers and technologies include supporting walls, holes, connecting parts, horizontal bridges, pin diameter, overhangs, unsupported walls, embossed and engraved details, machine tolerance, minimum features, and aspect ratios.

Students will also learn how designs change when making molds, fixtures, guides, prototypes, and end-use parts. The skills learned will be directly and immediately applicable to a number of classes on campus including 15.351 Intro to Making, MAS.863/4.140/6.943 How To Make (almost) Anything, and 2.810 Manufacturing Processes and Systems.

Class format:

The class uses lectures, homework, videos, and in-class work time. Most classes will start with a quick introduction to the topic of the day, followed by activities such as inventing challenges, 3D printing challenges, and team project time with one-on-one coaching by the instructor.

Students will have access through the instructor to a Makerbot Sketch and Fortus 380mc, however, will be more limited due to COVID-19.

Teams and Projects:

When an activity requires a team, teams of 2-3 students will be formed in class. Each team should then divide and conquer and each person will need to own a part of the project.

Expectations:

- **COMMUNICATING EFFECTIVELY:** Students will learn to present and explain their ideas with 3D models. Students are expected to ask questions frequently to avoid falling behind.
- **RESEARCH:** Students will be able to locate and critically evaluate information.
- **ACCOUNTABILITY:** Students are expected to attend all classes, complete any required reading, and turn in assignments on time.

NOTE REGARDING INTELLECTUAL PROPERTY RIGHTS:

Work done in the class is purely for academic purposes. There is no explicit, or implicit, agreement that teams in the class that reuse the material developed in the class are in any way entitled to a share of equity in a new venture that uses material developed in the class. All output from the class is deemed to be public domain unless explicitly specified and agreed to by the instructor.

INSTRUCTOR:

Mac Cameron - Email: mac1@mit.edu

Instructor, Martin Trust Center for MIT Entrepreneurship

OFFICE HOURS:

Office hours are as scheduled with the instructor.

CLASS RESOURCES:

A. Course Website: <https://mit.cocreatex.com/resources/>

B. Canvas: <http://canvas.mit.edu>

We will use Canvas to post all materials and to collect assignments.

Course materials will be distributed throughout the semester.

GRADING:

Grading for the class for this year will be strictly Pass/Fail (or more precisely "P/D/F").

- 25% Design Homework:
 - 05% Ring
 - 05% Lid
 - 05% Art or Medical Scan
 - 05% Mold
 - 05% "Invention"
- 20% Collaborative Design Project
- 25% Class participation
- 30% Final Project
 - 10% Design
 - 05% 3D Print
 - 10% Redesign
 - 05% Reprint

A passing grade is set at 75%.

DETAILED CLASS SCHEDULE:

#	Date	Topic	Description	Homework and Due Dates	
				Homework	Due Date
1	9/14	CAD	Intro to OnShape	HW 1 - Ring	
2	9/21	DESIGN GUIDE	Designing for 3D printers	HW 2 - Lid	HW 1 Due
3	9/28	SURFACING	CAD techniques	HW 3 - Art	HW 2 Due
4	10/5	SCULPTING	Intro to mesh design	Collaborative Design Project	HW 3 Due
5	10/13 Tuesday Class	APPLICATIONS	Designing for applications (molds)	HW 4 - Mold	
6	10/19	DESIGNING	Designing for applications (fixtures)	---	HW 4 Due
7	10/26	LATTICE	Guest lecturer and introduction to lattices	HW 5 - "Invention"	Collaborative Design Project
8	11/2	LATTICE	Lattice applications	Final Project Introduction	HW 5 Due
9	11/9	GENERATIVE	Introduction to generative design	---	Final Project Proposal Due
10	11/16	GENERATIVE	Project work time	---	Final Project Part 1 Due
	11/23	NO CLASS	Thanksgiving Holiday	---	---
11	11/30	PRESENTATION	Students present their final projects	Presentation	Final Project Part 2 Due

STUDENT POLICIES:

Ethics and Computer Equipment - This class subscribes to the MIT Sloan Professional Standards and to MIT's Standards of Academic Integrity.

Student Support Services - If you are dealing with a personal or medical issue that affects your ability to attend class, complete work, or take an exam, please discuss this with Student Support Services (S3). The deans in S3 will verify your situation, and then discuss with you how to address the missed work. Students will not be excused from coursework without verification from Student Support Services. You may consult with Student Support Services in 5-104 or at 617-253-4861. Also, S3 has walk-in hours Monday-Friday 9:00- 10:00 am.

Student Disability Services - MIT is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with Kathleen Monagle, Associate Dean, prior to or early in the semester so that accommodation requests can be evaluated and addressed in a timely fashion. Even if you are not planning to use accommodations, it is recommended that you meet with SDS staff to familiarize yourself with the services and resources of the office. You may also consult with Student Disability Services at 617-253-1674. If you have already been approved for accommodations, please contact the Student Disability Services early in the semester so that we can work together to get your accommodation logistics in place.