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4.463 Syllabus - Fall 2020

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4.463 Building Technology Systems: Structure and Envelopes // Fall 2020

Instructor: Caitlin Mueller // TA: Kiley Feickert

Subject Overview

SFO International Terminal, SOM, 2001

Lead Designer: [Allison Grace Williams](#)**Subject Description**

Addresses advanced structures, exterior envelopes, and building material systems with a focus on building performance and environmental impact of design strategies across these systems.

Addresses spanning systems, floor systems, lateral systems, vertical systems, and foundations, and a range of structural materials and their properties. The contemporary exterior envelope is discussed with an emphasis on the classification of systems, their performance attributes, climate-based design criteria, and advanced manufacturing technologies.

Environmental systems for active and passive conditioning are also reviewed in their relation to integrated building design.

State-of-the-art computational methods and tools are introduced and utilized for structural, envelope, and environmental system design.

Instructor

Caitlin Mueller, Associate Professor
<https://mit.zoom.us/my/caitlinm>
caitlinm@mit.edu

Teaching Assistant

Kiley Feickert, SMArchS BT candidate
<https://mit.zoom.us/j/96443725522>
feickert@mit.edu

Meeting Times*

Lecture: Monday, Wednesday, 9:30-11 on Zoom
 Lab: Friday, 10am-12pm on Zoom
 *see below for more details

Textbook

Readings will be provided via Canvas website

Units and Level

3-2-4, Graduate

Subject Canvas Website

<https://canvas.mit.edu/courses/4282>

Subject Zoom Room

<https://mit.zoom.us/j/91932368278?pwd=VURtelJnZWtsejBvblZyQXNlRUVXUT09>

Subject Meeting Structure and Schedule

Due to the conditions of the covid-19 pandemic, this subject will be mostly or entirely remote for the Fall 2020 semester, and class lectures, lab sessions, and meetings will take place in a combination of synchronous Zoom sessions and asynchronous pre-recorded video resources (along with the traditional readings, tools, email communication, etc. that contribute to subject interaction and engagement in a normal semester). The meeting structure for this subject takes inspiration from the [flipped classroom model](#) and the [tutorial system](#), and will prioritize interaction, collaborative problem solving, and small group discussions during the synchronous meeting times.

Students will therefore only be required to participate in a portion of the five “live” meeting hours per week; see below for details. A suite of tools and technologies (e.g. Slack, Google docs, etc.) will be introduced to enhance discussion, collaborative work, and feedback from instructors.

The general weekly schedule will follow the pattern below, with the caveat that this is subject to change depending on assessments of effectiveness during the term:

Mondays 9:30-11: Live lecture that students can attend synchronously or watch a recording of afterwards

Wednesdays 9:30-11: Three 30-minute discussion sessions with groups of ~10 students (students only need to attend one session, which will be randomly assigned each week for variety)

Fridays 10-12: Interactive problem-solving and tool demonstrations, distribution and beginning work on homework assignments (due on Monday 10 days later)

Assignments and Project

The main focus of this subject is a semester-long design project, supported by ten short homework assignments. For MArch students in the Core 3 studio, this project will integrate with the main Core 3 studio project. Other students will work on independent projects. Most assignments are to be submitted individually by students. Late assignments will not be accepted, unless extreme circumstances warrant an extension (must be arranged with TA 24 hours before deadline).

Homeworks will typically be assigned in lab on Fridays and due 10 days later. Time in lab each week will be devoted to completing portions of the homework. Each student's homework with the lowest grade will be excluded from their final grade calculation.

Grading Breakdown

Assignments: 45% (5% each)

Project: 40% (10% interim submission, 30% final review and submission)

Attendance and Participation: 15% (If live attendance is not possible for some students due to internet connection or time zone issues, we will find alternative ways to evaluate attendance.)

Office Hours

Meetings with the instructor will be by appointment. The TA will hold a weekly two-hour period on Zoom for students to come and ask questions about the class's content, assignments, etc. There will also be ample opportunities to ask questions in class, on Canvas, and anonymously on Google docs.

Absence Policy

Attendance and participation are mandatory and part of this subject's grade (15%). For students who are not able to attend the scheduled lecture/discussions and lab time due to issues

with time zones, internet connectivity, etc., alternative arrangements for participation will be made (please communicate with the instructor and TA in the first week of class). Missed discussion sessions or labs will be counted against the grade unless special arrangements are made with the TA 24 hours in advance.

NAAB Student Performance Criteria

Realm B: Integrated Building Practices, Technical Skills and Knowledge: B8, B9, B10, B12

Semester Schedule

Week	Lecture Mon. 9:30-11	Discussion Weds. 9:30-11	Lab Fri. 10-12	Assignments
01		W 9/2 Introduction and Carbon	F 9/4 Materials and Carbon Tools	HW1 given
02	M 9/7 <i>No Class</i>	W 9/9 Discussion: Climate Change	F 9/11 Material Reuse Tools	HW1 due, HW2 given
03	M 9/14 Light and Heavy Timber	W 9/16 Discussion: Materials 1	F 9/18 Tools for Struct Modeling I	HW2 due, HW3 given
04	M 9/21 Concrete and Steel	W 9/23 Discussion: Materials 2	F 9/25 Reading Materials	HW3 due, HW4 given
05	M 9/28 Structures Review	W 9/30 Discussion: Structures Rev	F 10/2 Structural Materialization	HW4 due, HW5 given
06	M 10/5 Spanning Systems	W 10/7 Discussion: Spanning Sys	F 10/9 Structural Connections	HW5 due, HW6 given
07	T 10/13 <i>(Monday schedule)</i> Floor Systems	W 10/14 Discussion: Floor Systems	F 10/16 Climate Analysis	HW6 due, HW7 given
08	M 10/19 John Ochsendorf Lecture	W 10/21 Discussion: Struct. Model.	F 10/23 Structural Case Study	HW7 due, HW8 given
09	M 10/26 Vertical + Lateral Systems	W 10/28 Discussion: Vert + Lat Sys	F 10/30 Virtual Site Visit	HW8 due HW9 given
10	M 11/2 Intro to Envelopes	W 11/4 <i>No Class</i>	F 11/6 Heat Flow + Thermal Mass	HW9 due
11	W 11/9 Thermal Barrier	W 11/11 <i>No Class</i>	F 11/13 HVAC Systems (Norford)	HW10 given
12	M 11/16 Glazing Systems	W 11/18 Discussion	F 11/20 Semester Summary	HW10 due

13	M 11/23 <i>No Class</i>	M 11/25 <i>No Class</i>	F 11/27 <i>No Class</i>	
14	M 11/30 Desk Crits	W 12/2 Discussion (Optional)	F 12/4 Desk Crits	
15	M 12/7 Desk Crits (Optional)	W 12/9 Desk Crits (Optional)		
F	M 12/14 <i>No Class</i>	T 12/15 Final Review*		Final Review* and Project Submission

** Final review will be held during Final Exam Week on Tuesday, December 15, 10am-12pm.*