4.117/4.118 - Creative Computation

Spring 2026

Simon Lesina-Debiasi
Postgraduate Teaching Fellow
MIT School for Architecture + Planning
slesina@mit.edu

Rodrigo Gallardo
SMArchS Design + Computation
MIT School for Architecture + Planning
ragallar@mit.edu

3-0-6 (graduate students)
3-0-9 (undergradutate students)

Wednesdays, 2PM - 5 PM
Room 3-442

Besler&Sons, "Staging Area, Part 2," 2025

Description

Digital design tools have accelerated the production of architectural representations and the creation of spatial form. The invention and optimization of CAD software rapidly increased the speed at which complex shapes and structures are being created and the implementation of AI tools has further expanded this development. However, computational tools in architecture have fostered an expectation of a particular aesthetic, removing itself from computational thinking that relates to environmental and material practices. Since architecture is not a finalized inert structure, but an ever changing and adapting spatial and material configuration, we need to steer away from the belief in uniformity, precision, and finalized formal expectations, and need to contend with process-based approaches that cherish changes, tolerances, variability, and adaptation.

This course is dedicated to bridging the gap between the physical world and computational methods, embracing modes of procedural thinking that are informed by material and conditional realities. Students engage in a series of design exercises that require both physical examination, research, and computational strategies, learning about the advantages and affordances to the different approaches while testing them through fabricated prototypes. This course is not designed to instruct you how to create smooth and complex geometry, nor does it try to be a course about digital software. We will explore and experiment with different modes of analysis, representation, modeling, and fabrication, not towards a fixed and finalized design objective but rather towards procedural thinking.

Overview

This course is organized into a full-semester investigation containing a series of assignments, exercises, and explorations that introduce students to a process-based approach towards the creation of a speculative material assembly. Since this studio is running in parallel with the Core 2 studio, students will be asked to examine and respond to material systems commonly used in New England. Exploring the construction materials through different lenses which are not concerned with users, enclosures, or programs, we will investigate them as aggregations with affordances and limitations. Throughout the semester, students will use digital tools to iterate, represent, and animate their processes, while creating models and physical prototypes to test and analyze the individual approaches. Finally, environmental considerations and performance metrics over time will introduce speculative and practical agencies into their assemblies.

Course Format

This workshop course will meet in-person every Wednesday afternoon. Students registered in the course are expected to attend all class meetings. Active participation in class exercises and discussions is equally important as the successful development of the different assignments and final projects. We will work independently and in small groups throughout the semester, incrementally building our framework, conceptual ideas, and working prototypes of our projects. The course is a working laboratory where students and instructors alike are exploring the opportunities and limitations of material systems and creating a collection of work investigating different assembly strategies. Students are expected to continuously work on their personal projects and meet the course deliverables and deadlines during class, and in between classes.

Course Structure

The class meets once a week, **Wednesdays, from 2PM to 5PM in room 3-442.** The first class will be held on Wednesday, February 4th, and will offer an overview of the course materials, learning objectives, and general structure of the course.
Each class time we start by discussing reading materials, findings, and experiences. Lectures, we will introduce gradually more conceptual and technical frameworks that will help us throughout the semester to work on the assignments and deliverables. Finally, in-class exercises and tutorials will assist students in framing their personal projects and cover essential components of project development.

Student Conduct, Rights, and Responsibilities

All students are expected to attend all class dates and activities, participate in the course exercises and tutorials, and submit course assignments in due time. The course credits for graduate students are 9 in total, divided into 3-0-6. Undergraduate students will do the same amount of work and will receive 12 credits as 3-0-9. Three hours of class time and six or nine hours of expected work in between classes respectively, initially in the form of reading materials and investigations, later as work time dedicated to exercises, prototypes, and a final project. The use of AI tools for the creation of text or visual components of assignments is prohibited. Troubleshooting process driven assignments can be assisted by AI tools. Since this is not a coding course, we can make use of AI chat tools to assist with our projects. Most of your own research and concept development should come from your own interests and ideas.

Course Preparation

Students will participate in a variety of activities during class times and will be required to work on their own projects. Every student will be required to bring their own laptop with charger and should think about getting a mouse (3D modeling and drawing software is possible with track pads, but most software is designed to be used with a mouse). Additionally, supplies to sketch, take notes, and record your progress is strongly encouraged.

Should you need any additional technical support or equipment, please contact the teaching team or reach out to Systems and Technology Organization of Architecture - STOA (https://stoa.mit.edu/ or via email stoa@mit.edu).

Attendance

Since the course only meets once a week, attendance for the full duration of the class is mandatory. 4.117/4.118 is an experimental learning environment that requires not only your presence but is also built upon your active participation. Developing your ideas, creating your structure and developing a coherent body of work require your attention and dedication throughout the semester.

Respect

It is important to us and the university that our workshop ensures that all students, staff, faculty, and members of the MIT community are treated with respect. As described in the MIT Values Statement, we cherish intellectual and creative excellence through an environment of free expression, debate, and dialogue in pursuit of truth. "We strive to make our community a humane and welcoming place where people from a diverse range of backgrounds can grow and thrive – and where we all feel that we belong". This is only achieved through decency, kindness, respect, and compassion for each other.

Belonging and Community

MIT values an inclusive environment. I hope to foster a sense of community in this classroom and consider this space to be a place where you will be treated with respect. I welcome individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, and political affiliations – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class. If this standard is not being upheld, please speak with us immediately.

Mental Health

As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may impact your ability to attend class, concentrate, complete work, take an exam, or participate in daily activities.

Undergraduates: Please discuss this with Student Support Services (S3). You may consult Student Support Services in 5-104 or at (617) 253-4861.

Graduate Students: Please reach out to the deans for personal support in the Office of Graduate Education. For urgent or after-hours concerns, please contact MIT Police.

MIT offers a range of counseling and mental health resources for students. Information on the available services can be found through MIT Health or online at https://health.mit.edu/services/mental-health-counseling. Do not hesitate to reach out if you are struggling so we can support you the best we can.

Student Support Services

If you are dealing with a personal or medical issue that is impacting your ability to attend class or complete work, students should contact a dean in Student Support Services (S3). These offices are here to help you. The deans will verify your situation, provide you with support, and help you work with your professors to determine next steps. In most circumstances, students are not automatically excused from coursework without verification from a dean. Please visit the S3 website (https://studentlife.mit.edu/wellbeing-support/student-support-services-s3/) for contact information and more ways that they can provide support. We, as the teaching team, will do our best to accommodate a learning environment that allows all students to learn, participate, and enjoy the course.

Course Schedule

February			
	Wednesday	02/04/2026	Course Introduction, Starting P01
	Wednesday	02/11/2026	Continue P01
	Wednesday	02/18/2026	**Pinup P01, Starting P02**
	Wednesday	02/25/2026	Continue P02
March			
	Wednesday	03/04/2026	Continue P02
	Wednesday	03/11/2026	**Presentation P01+P02****
	Wednesday	03/18/2026	Starting P03
	~~**Wednesday**~~	~~**03/25/2026**~~	~~**no class – spring break**~~
April			
	Wednesday	04/01/2026	Continue P03
	Wednesday	04/08/2026	Continue P03
	Wednesday	04/15/2026	**Pinup P03, Start P04**
	Wednesday	04/22/2026	Continue P04
	Wednesday	04/29/2026	Continue P04
May			
	Wednesday	05/06/2026	Continue P04
	Wednesday	05/20/2026	**Final Review P01+P02+P03+P04****

**review and pinup dates are subject to change until clear studio review dates are finalized

Assignments

P01 – Input: Material (Clock)
In teams of 2, students will select one building material commonly used in buildings in New England and isolate and analyze the local assembly systems and material aggregation. As part of the analysis, we will collect the relevant history of the material, common applications, material properties, dimensional ranges, assumed constraints, specific graphic notations, and processes of transformation and processing of the building material. Emphasis should be given to the life cycle of the material from sourcing to the manufacturing, distribution, installation, as well as demolition and recycling strategies. Students will present their findings to the class, using a series of images, authored drawings showing assembly methods, logics, and placement within a building system. Additionally, we will try to map the material origin and trajectory through its life using GIS.

P02 – Output: Assembly
Students will individually rationalize their material as an assembly or aggregation through different processes using parametric 2-dimensional drawings. These should explore both the controlled as well as speculative affordances within the chosen system and within the assumed material properties. From these we will create drawings of the assembly processes, showing the procedural aggregation, internal logic, invented notations, instructions, and permutations of the system. From there, students will take their assemblies into 3-dimensional prototypes that are executed both in digital space as well as in half-scale models, simulating the assembly and aggregation. We can test the ideas through performance metrics, ease and sequence of assembly, center of mass, responsiveness, and many more. We will share the results through drawings, instruction manuals, models, as well as time-based media like animations and stop-motion short films.

P03 – Factors: Site Sensing
To find additional environmental factors that influence and manipulate our building materials, we will take a step away from our assemblies for a moment. During this exercise, teams of two will create a sensing or measuring device that tracks, maps, draws, or records in any ways environmental conditions. The devices can be made of any material and students who are interested in digital sensing devices and small electronics (Arduino) are invited to convert physical phenomena into digital and physical outputs. This fabricated device should be able to track impact, volume, amounts, or accumulation of their sensed factors, and represent them in the format that best suits their device. Additional drawings explaining the sensing device as well as an instruction manual how to interpret the readings will accompany the device and recorded "data."

P04 – Feedback: Adjusted Assembly
Finally, we will, in groups of 2, evaluate our measurements and recordings and extract a factorization or parameter that we feed back into our assembly system (P02). Acknowledging the material properties, students will use their data input as a factor within their assembly system and re-evaluate tolerances, formal expectations, and performance developments within their larger assembly. These additional rules within the assembly logic should give the exploration an additional interactive rule to be determined by each group. We will use the material intelligence we have assembled, together with the construction logic prototype/models, we ascertain and link them with the environmental condition we investigated. These findings and experimentations should be executed in both parametric modeling as well as 1:1 assembly prototype to be exposed to the elements over the course of the summer.

Evaluation Criteria and Grading

All students are expected to attend all classes and participate in presentation updates, final presentations and discussion of presented work. If attending class is not possible, please contact the instructor beforehand to arrange an alternative. Regular attendance of weekly sessions is crucial for design development and live project discussions.

The following criteria will be used for the evaluation of students' work, both in terms of helping their progress and in final grading.

1. Thesis: How clearly is the student articulating the conceptual intentions?

2. Translation of Thesis: How well is the student using their thesis to develop a design response to given problems?

3. Representation Appropriateness: How well matched is their choice of representational means to their intentions?

4. Prototyping Quality: How accomplished are they in drawing, modeling, digital representation, and prototyping?

5. Oral Presentation Skills: How clearly are they presenting their ideas orally, whether at their desk, in class discussions, or to a more formal jury?

6. Participation in Discussions: How actively and how constructively are they involved in class discussions, both formally and informally?

7. Response to Criticism: How do they effectively take advantage of criticism from instructors, classmates and outside jurors?

8. Auto-Critical Skills: To what extent are they able to critique their own work regularly and effectively?

9. Attendance – attendance to all classes is mandatory, please email beforehand for excused absence.

A: Excellent - Project surpasses expectations in terms of inventiveness, appropriateness, verbal and visual ability, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class.

B: Above Average - Project is thorough, well researched, diligently pursued, and successfully completed. Student pursues ideas and suggestions presented in class and puts in effort to resolve required projects. Project is complete on all levels and demonstrates potential for excellence.

C: Average - Project meets the minimum requirements. Suggestions made in class are not pursued with dedication or rigor. Project is incomplete in one or more areas.

D: Poor - Project is incomplete. Basic skills including graphic skills, modelling skills, verbal clarity or logic of presentation are not level appropriate. Student does not demonstrate the required design skill and knowledge base.

F: Failure - Project is unresolved. Minimum objectives are not met. Performance is not acceptable. This grade will be assigned when you have excessive unexcused absences.