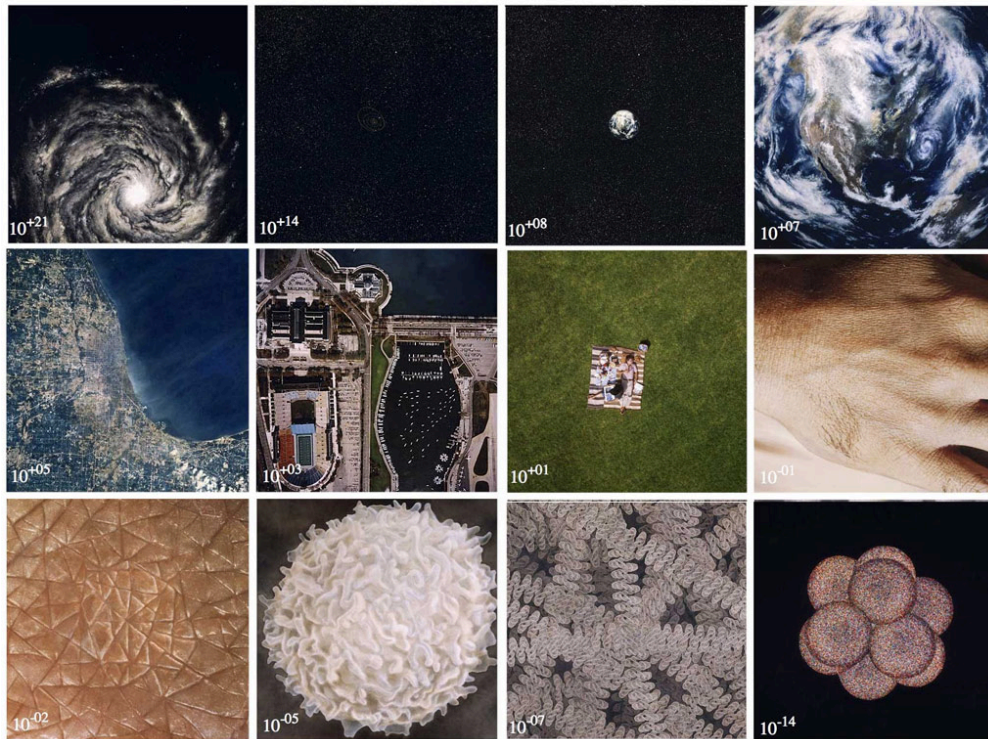


4.110: Design Across Scales and Disciplines

MIT Spring 2025



Film stills from *The Powers of Ten* by Charles and Ray Eames (1968)

Instructors Nicholas de Monchaux ndm@mit.edu
 John Ochsendorf jao@mit.edu
 Danniely Staback Rodríguez dstaback@mit.edu

TAs Logan King tlkiing@mit.edu
 Avigail Gilad avigilad@mit.edu

Credits 2-2-8 (UG)

Class Sessions Tuesdays, 10 AM- 12 PM. N52-337

Lab Sessions Wednesdays, 7 - 9 PM. N52-337

Syllabus

“*Design designs. We design our world, while our world acts back on us and designs us.*”¹

“*The problems we [are] likely to face as a world [are] not going to be demarcated with disciplinary boundaries.*”²

COURSE DESCRIPTION

Design Across Scales and Disciplines exposes salient, contemporary design challenges and gives design tools to approach them. Its interdisciplinary structure emphasizes that design today thrives on opportunities from the molecular to the planetary. This course defines design as meaning-seeking and sense-making; as a process rather than an outcome.

The class is built around conversations with guest speakers representing how design operates across disciplines—from architecture, to the design of materials and computational systems, to the design of cities and landscapes. Taking a cue from the 1977 Eames Office film *Powers of Ten: A Film Dealing with the Relative Size of Things in the Universe and the Effect of Adding Another Zero*,³ the speakers consider scales ranging from that of the human body to the largest and smallest scales at which design may intervene. With their contributions, we will approach some of the key questions design disciplines need to address today.

Our session’s movement between disciplines and scales will introduce us to the multiple areas shaped by contemporary design practices, and will help us make connections between them. Today, design doesn’t only concern the creation of isolated objects, but the consideration of the different systems and externalities associated with them. To do so, we designers need to think, more than ever, across disciplines and scales. We need to situate our design intentions within broader social and environmental concerns. We need to consider how design addresses different publics and cultures, different economies and ecologies. The course’s full commitment to cross-disciplinary practice aspires to build a shared design culture across MIT—from engineering, to architecture to planning; from science, to computing, to the arts—capable of responding to design’s evolving responsibilities.

With that goal, you will engage with the class in two ways:

- Dialoguing with our speakers through Tuesday’s class sessions, held in the form of lectures, workshops and “round table” conversations.

¹ Anne-Marie Willis, “Ontological Designing: Laying the Ground,” *Design Philosophy Papers* 13, no. 1 (2006): 80.

² Stein, Lynn Andrea (2022, August). *Sketch Model Episode 3* (season 1, episode 3). <https://www.olin.edu/sketchmodel>

³ The film was based on a 1968 black and white prototype, *A Rough Sketch for a Proposed Film Dealing with the Powers of Ten and the Relative Size of Things in the Universe*, reportedly inspired by the book *Cosmic View* (1957) by Dutch educator Kees Boeke.

- Exploring design through individual, partnered and group exercises in the lab and through sketchbook homework assignments directly related to our class topics. These assignments will allow you to work through different scales and media.

Our team of Teaching Assistants will lead Wednesday's lab sessions. The TAs will introduce you to design methodologies, give feedback on your design explorations, and provide instruction on the techniques and resources you may need. The class Canvas site also provides a list of available design resources at MIT.

Design is a highly interactive and iterative endeavor. Conversation, feedback, and critique are the media where design grows and improves. Our combination of talks and design explorations aims to produce a space of open conversation for the interchange of design ideas; one where we learn about design, constantly and through different means.

COURSE STRUCTURE

The course structure consists of three main elements:

1. Conversations, 2-hour Tuesdays class, 10am-12pm
Weekly classes will take the form of an active dialogue. Invited guests will present short lectures on their work, engage in a dialogue with students regarding topics of design, or conduct workshops with the students on the topic and guiding questions of the week. The aim is for these classes to take the form of an active, flexible conversation rather than a traditional lecture.
2. Laboratory Workshop, 2-hour Wednesday lab, 7-9pm
Assignments, technical workshops and design progress will form the Design Across Scales Laboratory. The lab will act as the main space for sharing work, receiving critique and feedback from peers, and pushing design projects forward together.
3. Readings and Sketchbook Homework, weekly or multi-week
The lab does not include a dedicated readings discussion, but the readings will inform the assignments and exercises in the lab. The readings will function more as a toolkit for you to use toward the lab exercises.

Sketchbooks are due and must be physically handed in during Tuesday's class to afford the teaching team enough time to review the work before Wednesday's Lab.

CLASS EXPECTATIONS

Students are required to fulfill the following requirements for participation and grading.

Participation

Design is a social art, and so it is essential that it be taught and studied in groups, and substantially in person. Therefore, attendance will be taken by your TA during both the class and lab sessions. It is your responsibility to ensure your TA sees you during class; attendance may be taken at any time during the class period.

If you have a documentable conflict, you can get credit for the lecture or lab session through a makeup arrangement ahead of time with a TA. Except for true emergencies (supported with documentation from a dean or doctor), no makeups will be given after the class in question.

We will dedicate the first session to discuss a shared attendance policy for the class - one you feel committed to and that it's operative for all the students involved. This policy will include both your personal presence and that of the working materials you'll need to bring to the class and to the lab.

A final note relates to the class' **no-screen request**. This is hard for all of us in a connected age! But it substantially improves the focus and quality of our discussions, and the work that results from them. If you find yourself truly needing to respond to a call or other phone-related emergency, please feel free to do so but leave the classroom quietly.

Presentation of guests and discussion

We want to have vibrant conversations with our very interesting guests. This implies that you should know a little about their work in advance of their visit, and also that you start thinking about the topics of their lecture. Every week, a selected team of students will be in charge of presenting the guest lecturers and adopting a leading position in the talk, but we expect all the students to actively participate in the discussion.

The team responsible for leading the conversation will need to create a comprehensive outline, including a minimum of 10 questions for class discussion. The goal of this format is to allow you to make connections between your own individual experiences and disciplines, and the questions that we are working on as a class. You might be studying something in another subject, for example, which you can relate to something covered in the reading. Or perhaps you have observed something in your own environment, present or past, which might illustrate (or contradict) a point presented by the author. All of this is fair game. You will produce one comprehensive outline per group, to be submitted to your TA by 12:00 midnight of the Sunday prior to your discussion. The students who are not participating in the leading team should equally prepare at least one question per lecture.

Design Explorations - Weekly assignment and final project.

Every week you will work, either individually or in collaboration, in a design exploration related to the weekly topics and guiding questions we are considering in class. The design explorations are your opportunity to start testing design ideas and methodologies, and to engage in dialogue with your peers, TAs and instructors about your key interests. We will provide materials and specific instructions aimed at helping you structure the work, as well as guidance and feedback about your production. Although these explorations vary from week to week, they also build upon each other in a cumulative manner. Our intention is that, by the end of the term, you will have been able to clearly locate which are your design interests, and to understand which are the main media that allow you to effectively work on them.

To the extent that the neurology of design and creativity are understood, there is a direct analogy between the neurology of play, creativity, and ultimately design, that involves both active/sensing parts of the brain and the ability to literally or cognitively ‘repurpose’ existing or previously experienced objects and situations to fit a novel or urgent situation.⁴ Taking a cue from one of the earliest designed systems for integrating education in form and color, learning and creativity, the so-called “Spielgabe” or “play-gifts” developed by educator Friedrich Froebel for his first Kindergarten starting from 1837, in the first week of classes we will give you a primary gift to start working on your assignments, a design toolkit, that includes: a sketchbook, an x-acto knife, glue, and a cutting mat. The sketchbook will be your primary working space. You’ll use it to take class notes, to test and sketch your weekly homework, and to represent in it the outcome of each one of your Design Exploration. At the end of the term, we will ask you to scan the pages containing your Design Explorations, and to combine them all in a foldable, *design zine*.

The Design Explorations are divided into two sections. From week 1 to week 6, we will test fundamental design methodologies through a series of interrelated explorations. In week 6, we will start working on a final design project that will be concluded on the last week of classes. This exercise will be an intervention - which you will design and fabricate - in a space at MIT.

Course ToolsGuiding Questions:

Each week’s topic is supported by guiding questions that lead the conversation, lab exercise and/or homework assignments. Inquiry plays an important role in nurturing and sustaining a design practice. Defining a set of questions is a key first step in shaping a design project. Design Across Scales revolves around questions of design, ethics, materials, values, etc. Students are encouraged to take note throughout the semester of certain questions they would like to tackle in their own work.

⁴ See Chryssikou, Evangelia G., and Sharon L. Thompson-Schill. “Dissociable Brain States Linked to Common and Creative Object Use.” *Human Brain Mapping* 32, no. 4 (June 9, 2010): 665–75. <https://doi.org/10.1002/hbm.21056>.

The Sketchbook:

In this course, we will introduce you to an important tool that will support your design process and facilitate the presentation and archiving of your work. Our intention is that you will acquire the habit of documenting the entire process of designing, while incorporating reflection into your practice. Thus, we will encourage you to write about what worked, what did not, what was difficult, the roadblocks that you hit, the questions you encountered, and what surprised you in each exercise.

The sketchbook functions as your repository for all class work. Each student will receive a physical sketchbook to use for in class, lab and homework exercises, and for recording early ideas, sketches, and the development of their work. At the end of the course, the sketchbook will be filled with experiments, reflections and documentation of the journey through the semester. The work of the sketchbook will be documented and represented in a final hand-built monograph of your work this semester.

Materials:

Through the course, you will become comfortable with common analog design tools such as an exacto knife, cutting mat, ruler, rubber cement, double-stick tape, drawing implements, and tools for dimensional drawing. These analogic materials are not necessarily easy to use, but getting acquainted with them is a pedagogic goal of the class.

It is crucial that you bring all of these materials to each session. They are as important as your corporal presence, as they are both the tool and register of your work. Thus, the attendance policy we will design in our first session also includes the need to bring the materials to the class.

Office Hours with the instructors

In addition to the lab sessions and working with your TAs, the instructors are available for office hours by appointment. Please email or talk to us for any course matter that you need to discuss.

GRADING AND ACADEMIC OBJECTIVES

Grading

10% — Preparation of conversation with the speakers. Consisting in: 1) Research about their work and design interests and presentation of the guests; 2) Elaboration of questions for speakers;

25% — Active participation in class and lab sessions.

65% — Design explorations. Consisting in: 1) Elaboration of weekly design tests, sketching in the journal (40%); 2) Final presentation (10%) 3) Final design monograph - design zine (15%). The weekly assignments will be graded 1-10, and then translated to C-A system for final grade.

Grading definition

A. Exceptionally good performance demonstrating a superior understanding of the subject matter, a foundation of extensive knowledge, and a skillful use of concepts and/or materials.

B. Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject.

C. Adequate performance demonstrating an adequate understanding of the subject matter, an ability to handle relatively simple problems, and adequate preparation for moving on to more advanced work in the field.

D. Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating deficiencies serious enough to make it inadvisable to proceed further in the field without additional work.

F. Failed. This grade also signifies that the student must repeat the subject to receive credit.

NE. No record will appear on the external transcript.

Student Performance Criteria. NAAB

Realm A: Critical Thinking and Representation

• A1. Communication Skills: Ability to read, write, speak and listen effectively• A2. Design Thinking Skills: Ability to raise clear and precise questions, use abstract ideas to interpret information, consider diverse points of view, reach well-reasoned conclusions, and test alternative outcomes against relevant criteria and standards. • A3. Visual Communication Skills: Ability to use appropriate representational media, such as traditional graphic and digital technology skills, to convey essential formal elements at each stage of the programming and design process. • A5. Investigative Skills: Ability to gather, assess, record, apply, and comparatively evaluate relevant information within architectural coursework and design processes.

CLASS SCHEDULE

PART 1: Finding a shared language, and our individual voices (Week 1-4)

Introduction to principles of design, design criticism & methods of working

Week 1: Design Across Scales and Disciplines, Let's design this class together

Dates: Class February 4, Lab February 5

Guiding Questions:

What is design?

What is interdisciplinary design?

What are design questions?

What is design research?

Design Toolkit: Play and Process, Authoring your own Education

To read in preparation for Lab:

Jarret Fuller, "[When did Design Stop Being "Multidisciplinary?"](#), *A.G.A: Eye on Design*. Web. October 19, 2020.

Jenny Odell, "[There's No Such Thing as a 'Free Watch.'](#)" Web. August 18, 2017.

Week 2: Collection: Arrangement, Connection, and Context

Dates: Class February 11, Lab February 12

Conversation Guests: Behnaz Farahi & Skylar Tibbits

Guiding Questions:

What does design consist of?

What constitutes a design decision?

Is arrangement and cataloging an act of design?

Are designers curators? Are they researchers? Are they collectors?

Design Toolkit: Inquiry as Process; How to look

To read in preparation for Lab:

Jenny Odell, "[On collage and the practice of searching, finding, and filing.](#)" *Pioneer Works / Broadcast*. Web. 2023.

Skylar Tibbits, "From Automated to Autonomous Assembly," *AD: Architectural Design* 87, no.4 (2017): 6-15.

Week 3: Design is Around Us (I) Nothing is Entirely New: Precedents & Research

No Class due to Holiday, Only Lab on February 19th

Guiding Questions:

Where do designs come from?

Does every design have a lineage?

Are there any new ideas?

What role does critique serve?

How do feedback and criticism show up in your own discipline?

Design Toolkit: Collecting and Archiving; Appropriation and Remix

To read in preparation for Lab:

Stephen Jay Gould, “The Spandrels of San Marco and the Panglossian Paradigm. A Critique of the Adaptationist Programme,” *Proceedings of the Royal Society of London Series B - Biological Sciences* (1970): 581-598.

Week 4: Design is Around Us (II) Everything is worth discussing: Critique vs. Criticism

Dates: Class February 25, Lab February 26

Conversation Guests: Jenna Fizel & Wombi Rose

Guiding Questions:

Where do designs come from?

Does every design have a lineage?

Are there any new ideas?

What role does critique serve?

How do feedback and criticism show up in your own discipline?

Design Toolkit: Critique, Criticism & Feedback and Reflection

To read in preparation for Lab:

Liz Lerman, [“Critical Response Process,”](#) (Tahoma Park, MD: The Dance Exchange Inc, 2003) 6-25.

PART 2: Leveraging our Differences; Sharing questions, perspectives, and skills across disciplines (Week 5-8)

Wider context for design work, connecting across disciplines and sharing expertise, contextualizing our work

Week 5: Translating Design Across Disciplines

Dates: Class March 4, Lab March 5

Conversation Guests: Mariana Popescu

Guiding Questions:

Does design mean the same thing across disciplines?

What makes a design question specific to a certain discipline?

Design Toolkit: Translating & Communicating

To read in preparation for Lab:

Nicholas de Monchaux, *Space Suit: Fashioning Apollo* (Cambridge, MIT Press: 2011), 315-342.

Oswald Mathias Ungers. "City Metaphors," in *MAN transfORMS*, George Nelson ed. (New York, Cooper Hewitt Museum: 1976), 98-113.

Week 6: The Power of Design: Designing for/with whom?

Dates: Class March 11, Lab March 12

Conversation Guests: Deb Chachra

Questions:

Who do our designs leave out?

How to design with accessibility in mind?

Is universal design truly universal?

Design Toolkit: Sharing Research, Communicating to the Wider Public

To read in preparation for Lab:

Hashim Sarkis, "How Will We Live Together?" in *Catalog of the 17 International Exhibition - La Biennale de Venezia 2021* (Venice: La Biennale de Venezia, 2021), 24-31.

Week 7: Communication & Documentation : Sharing Design with the Public

Dates: Class March 18, Lab March 19

Conversation Guests: Matthew Carter

Guiding Questions:

How does design communicate?

How does design help us understand society?

How does a design craft its own narrative of the information it communicates?

Design Toolkit: Contextualizing & Evaluating

To read in preparation for Lab:

Katy Waldman, "[When the World Isn't Designed for Our Bodies.](#)" *The New Yorker*, 3 Sept. 2020,

Week 8: SPRING BREAK

Dates: March 24 - 28

PART 3: Activating Space Through Design, Final Project (Week 9-15)

Working on parts of a whole with a collective vision

Week 9: Shared Authorship, Collaboration & Collective Design

Dates: Class April 1, Lab April 2

Conversation Guests: Lila Chrysikou

Progress Presentations per team.

Guiding Questions:

Whose design?

How to work collaboratively with clients, community and diverse teams?

Design Toolkit: Collective Coordination - Choreography

To read in preparation for Lab:

Hauderowicz, Dominique and Kristian Ly Serena, *Age-Inclusive Public Space* (Berlin: Hatje Cant, 2020), excerpts.

Week 10: Real Design & Speculative (?) Work

Dates: Class April 8, Lab April 9

Conversation Guests: Andrew Witt & Mark Jarzombek

Guiding Questions:

How to design for a changing public / changing world?

Design Toolkit: Formulating open-ended design questions; Following leads; Reframing "success" in design projects

To read in preparation for Lab:

Mitch Resnick, ["Ten Tips for Cultivating Creativity,"](#) *Lifelong Kindergarten* (Cambridge, MA: MIT Press, 2017), excerpts.

Week 11: Process: Design, Fabrication & Installation as a Connected Practice

Dates: Class April 15, Lab April 16

Conversation Guests: Laia Mogas Soldevilla & Josephine Carstensen

Guiding Questions:

How do materials inform the design process?

What is the role of constraints in design?

Design Toolkit: How to move from idea into fabrication, the importance of testing and prototypes

To read in preparation for Lab:

Alice Rawsthorn, “Prologue?” and “Out of Control,” in Design as an Attitude (Zurich: JRP Ringier Kunstverlag AG, 2018), 4-16, and 108-120.

Week 12: Design Charette

Dates: Class April 22, Lab April 23

Desk Crits with instructors TBD.

Week 13: Design Charette

Dates: Class April 29, Lab April 30

Desk Crits with instructors TBD.

Week 14: Design Charette

Dates: Class May 6, Lab May 7

Desk Crits with instructors TBD.

Week 15: Last Class Celebration!

Dates: Class May 13

Final Class Session

ADDITIONAL INFORMATION & RESOURCES

Land Acknowledgement Statement

We acknowledge Indigenous Peoples as the traditional stewards of the land, and the enduring relationship that exists between them and their traditional territories. The lands which MIT occupies are the traditional unceded territories of the Wampanoag Nation and the Massachusett Peoples. We acknowledge the painful history of genocide and forced occupation of these territories, as well as the ongoing processes of colonialism and dispossession in which we and our institution are implicated. Beyond the stolen territory which we physically occupy, MIT has long profited from the sale of federal lands granted by the Morrill Act, territories stolen from 82 Tribes including the Greater and Little Osage, Chippewa, and Omaha Peoples. As we honor and respect the many diverse Indigenous people connected to this land from time immemorial, we seek to Indigenize our institution and the field of planning, offer Space, and leave Indigenous peoples in more empowered positions.

Inclusive Class and Classroom

MIT values an inclusive environment. I hope to foster a sense of community in this classroom and consider this classroom 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, religious 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 feel free to speak with me.

Special Accommodations

MIT is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with Disability and Access Services (DAS), prior to or early in the semester so that accommodation requests can be evaluated and addressed in a timely fashion. If you have a disability and are not planning to use accommodations, it is still recommended that you meet with DAS staff to familiarize yourself with their services and resources. Please visit the DAS website for contact information. If you have already been approved for accommodations, class staff are ready to assist with implementation. Please inform Professor Ryan at bdr@mit.edu who will oversee accommodation implementation for this course.

Academic Integrity and Honesty

MIT's expectations and policies regarding academic integrity should be read carefully and adhered to diligently. Plagiarism is a major academic offense. Read: <http://integrity.mit.edu>.

Writing and Communication Resources

The WCC at MIT (Writing and Communication Center) offers *free* one-on-one professional advice from communication experts. The WCC is staffed completely by MIT lecturers. All have advanced degrees. All are experienced college classroom teachers of communication. All are all are published scholars and writers. The WCC helps you strategize about all types of academic and professional writing as well as about all aspects of oral presentations (including practicing classroom presentations & conference talks as well as designing slides). No matter what department or discipline you are in, the WCC helps you think your way more deeply into your topic, helps you see new implications in your data, research, and ideas. The WCC also helps with all English as Second Language issues, from To register with our online scheduler and to make appointments, go to <https://mit.mywconline.com/>. To access the WCC's many pages of advice about writing and oral presentations, go to <http://cmsw.mit.edu/writing-and-communication-center/>. Check the online scheduler for up-to-date hours and available appointments.