

4.031: Design Studio: Objects and Interaction

Instructor: Marcelo Coelho

W 3-5 F 2-5 pm

Fall 2026



Synthia camera by Joanne Hong, Joshua Camacho, and Pria Sawhney

Studio Overview

This course is an overview of design as the giving of form, order, and interactivity to the objects that define our daily experience. Instruction follows the path from concept to interactive product through lectures, hands-on workshops, and studio assignments. Students will gain an understanding of the overall design process, with an emphasis on design development, iteration, and constraints, preparing them for work in a product design studio.

Topics include the analysis and critique of objects; interaction design and user experience; current dialogues in industrial and interaction design; economies of scale vs. means; and the role of computation and technology in design.

This course provides a foundation in prototyping skills such as carpentry, digital fabrication, electronics, coding, and interaction, enabling students to create fully functional products. Lectures will provide a technical foundation to enable students to create their products, as well as a foundation in the current dialogues in the design, production, and significance of objects.

Project 1: Design an Analog Camera

In this project, you will design a camera for producing cyanotypes. Cyanotypes use a photographic printing process that produces prints with a cyan-blue color, achieved through a chemical reaction when light-sensitive paper is exposed to UV light. Your design should be easy to use, reliable, and clearly communicate how it works and should be used. You will be encouraged to experiment with new techniques beyond a traditional camera obscura.

Project 2: Design a Digital Camera

In this project, you will design an interactive digital camera. You will use a Wizard of Oz prototyping strategy to develop new form-factors, interaction models, and creative applications for cameras.

Learning Objectives

The course is divided into two projects that explore the fundamental skills required in product design today. Students should be able to engage with an increasing level of design research and prototyping through a series of iterative studies and short assignments. Upon completion of this course, the student should have a firm understanding of:

- The structure and flow of a design project (opportunity, research, brief, design development, presentation, working drawings, production, critique);
- Digital and craft-based design and prototyping skills (woodwork, programming and electronics, rapid prototyping and digital fabrication, metal bending, and other techniques);
- Design communication and language;
- Model-making, mock-up, and prototyping;
- Design criticism and the role of feedback in design development.

Where to Find Things and Communication

General class materials and grades will be posted on **Canvas**:

<https://canvas.mit.edu/courses/39991>

General class communication will take place through **Slack**: [#design-objects-2026](#) (ask the TA to add you if you cannot connect)

Important communication such as absences, personal problems, and needs should take place directly through **email**: 4.031@mit.edu (This email reaches both your instructor and TA team)

Your final project deliverables will be submitted on [Google Drive](#).

Information about Architecture Shops: <https://archshops.mit.edu/>

Calendar for the MAD Shops: <https://project-manus.libcal.com/calendar/madshops>

Completion Requirements

Completion of each of the projects, rigor in process and clarity in representation, as well as the overall progress of the semester (including attendance) will be fundamental to completing the course.

Evaluation Criteria and Grading

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, interests, or ideas?
3. **Appropriateness:** How well matched is their choice of representation and prototyping strategy to convey their intentions?
4. **Quality:** How accomplished are they with drawing, modeling, digital representation, fabrication, etc? To what degree does their product convey what they ought to?
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:** – see below.

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, model-making 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.

Grade Distribution

Each of the two projects and class participation will count towards your grade:

Project 1:	40%
Project 2:	50%
Participation	10%

Studio Culture

Work in the studio will build sequentially. Therefore, your commitment to incremental development on a daily basis is of paramount importance. The demanding nature and pace of studio courses necessitates your regular attendance and requires that deadlines be consistently met. In addition to lowering your grade, late work will prevent you from following the overall structure of the course.

It is important that you take advantage of the studio environment. Magnification of your development as a designer is made possible by the collective nature of the studio. Group reviews are collective for a reason. Each of you has something to gain from your peers.

Since the studio is a place for all, it necessitates careful attention to the needs of everyone in it. Please see your instructors or TAs if there are any problems that you are unable to resolve on your own.

Attendance

Attendance for the full duration of each studio is mandatory. This means **arriving on time** and staying until the end of the studio.

You are allowed 3 excused absences for the semester. An excused absence is defined as one that was discussed with and approved by the professor *at least 24 hours* prior to the date of absence, or a family or medical emergency that is confirmed by your physician or a dean in Student Support Services.

A **late arrival** (> 5 min late) will count as a 1/2 absence, and is added towards your total of 3 excused absences.

Absences beyond the three allotted will result in a decrease in your final grade. If you miss 6 or more studio classes in total, you will be asked to drop the subject or receive a failing grade. Please reach out early and often if you believe you might have trouble completing the course.

Academic Integrity + Honesty

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

Documentation

Students are expected to visually document their assignments, research, prototypes, and any pertinent material. Strategies for visually documenting design work will be presented throughout the semester. You should dedicate a sketchbook exclusively for the class.

Bring your sketchbook to every class, and always be ready to sketch and show previous sketches you've done.

Final Studio Deliverables

Grades will not be posted for students to view on their grade report until their work has been archived. Documentation needs to be properly prepared and formatted, and delivered to the Archiving TA. Studio TA's will collect project archives from each student following the review. Detailed requirements and instructions for formatting will be communicated with each project.

Contact Information

4.031 Team ← You will get a faster response
4.031@mit.edu

Instructor:
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Teaching Assistant:
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Nancy Wu
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Technical Instructor:
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Shop Manager:
Chris Haynes
haynesc@mit.edu

Materials List

Please have these materials in studio for every class session so you can sketch and make physical prototypes and mockups:

sketchbook
ruler with mm and in
pencils
olfa knife
exacto blade
scissors
cutting mat
super glue
hot glue
masking tape

Software

Rhino/Solidworks/OnShape
Adobe Creative Suite
Figma
Arduino IDE
Visual Studio Code

You can download most of these from [METIS](#) or [MIT IS&T](#)

Schedule

**** tentative schedule, some things may change ****

Week 1	Introduction to Course + Project 1
09/09	Introduction to the Course
09/11	Introduction to Project 1 Cyanotype How-To
Week 2	Training and Concept Development
09/16	MAD Shop Training
09/18	Architecture Shop Training Sketching + Cardboard Prototyping
Week 3	Low-Fidelity Prototyping
09/23	Group Review and Critique Due: Cyanotype Photograms
09/25	Woodworking Basic Training Due: Camera Concepts (Sketches and Cardboard)
Week 4	High-Fidelity Prototyping
09/30	CAD Tutorial + Laser Cutting + 3D Printing Due: Camera Cardboard Prototype
10/02	Future Fest: Panel with Tony Fadell Review CAD drawings and fabrication plans Due: CAD Drawings + Physical Prototypes
Week 5	Fabrication + Finishing
10/07	Mid-Project Critique 'Play' Testing Session
10/09	Surface Finishing + CMF Due: Working Prototype
Week 6	Fabrication + Documentation
10/14	Documentation Techniques Work Session
10/16	Individual Critique Dry-Run Due: Sketch of Presentation Slides + Documentation Plans

Week 7	Final Critique
10/21	Due: Final Camera
10/23	Documentation Collection Due: Project 1 Final Critique
Week 8	Introduction Project 2 + Concept
10/28	Introduction Project 2 Introduction to Electronics
10/30	Introduction to Sensors Camera Control Code Examples Due: Electronics Warm-Up Exercise
Week 9	Prototyping for Interaction
11/04	Due: Initial Concepts and Ideas
11/06	Due: Electronic Prototypes Due: Group Review of Concepts and Prototypes
Week 10	Low-Fidelity Prototyping
11/11	<i>No Class (Veteran's Holiday)</i>
11/13	In-class Review of Cardboard Prototype Due: Working Cardboard Prototype
Week 11	User Testing and Iteration
11/18	Work Session
11/20	Play Testing Due: Lo-fi electronics and cardboard prototype Due: Group Mid-Project Critique
Week 12	High-Fidelity Prototyping
11/25	Work Session Due: CAD + Fabrication Plans Due: Material Shopping List
11/27	<i>No Class (Thanksgiving / Institute Holiday)</i>
Week 13	Work-Like + Look-Like Integration
12/02	Work Session
12/04	Due: Work-like + Look-like Integration

Week 14	Finish + Documentation
12/09	Documentation Techniques (Video) Due: Critique Dry-Run + Review of Documentation Plans
12/11	<i>No Class</i>
Week 15	Final Critique
TBC 12/18	Due: Final camera Due: Project 2 Final Critique