4.021: How to Design (Almost) Anything

Class Overview: Introduces fundamental design principles as a way to demystify design and provide a basic introduction to all aspects of the design process. Through lectures and weekly exercises, students will develop their skills and enable creativity, abstract thinking, representation, iteration and design development. An introductory class intended for students without a design background geared towards enabling more effective collaboration with designers and the ability to apply the foundations of design to any discipline. Limited to 25; preference to Course 4 and 4B majors and Design and Architecture minors, and first- and second-year students.

Structure of the Course - Weekly:
- Monday: 15-30min intro presentation on the topic then student presentations/group desk crits
- Wednesday: Individual desk crits and discuss next week’s assignment

Exercise 1: The Design Process
The first project explores the design process. Each week the class will dive into one aspect of the design process from context to concepts, drawing, making, iterating, building a narrative and finally presenting a design idea and its implementation. This path exemplifies a traditional design process where a designer starts with an idea and works through testing, expanding, refining and eventually realizing it. Through weekly topics and assignments, students will develop a variety of design skills relating to each stage of this path. The project will start with an exercise on analog drawing, where students will develop a series of rules to generate a 2-dimensional drawing. Then students will use paper as a material medium with various fabrication methods (folding, layering, crumpling, cutting, weaving, shredding, etc.) to test, expand and refine the initial rules, transforming them from rules for drawing into rules for making. In this stage of the project students will be asked to develop a concept for a functional light enclosure made from paper. Concepts should be focused on the performance of the enclosure – i.e. with regards to transparency, translucency, views, optics, movement etc. – and its relation to the method of making.

Context >> Concept >> Draw >> Make >> Iterate >> Analysis/Narrative >> Present

Exercise 1 - Assignment 1: Drawings
Due: Monday September 7

The first week’s assignment is to develop a drawing that features the process of iteration, a concept essential to design that we will explore in various ways throughout the rest of the semester. You will invent a drawing method by developing a series of rules that govern its use.

- Starting with a geometric primitive (i.e. point, line, plane, curve, etc.) placed at a location of your choice within a piece of drawing paper, develop rules for transforming this initial primitive (e.g. move, rotation, reflection, scale, deformation, etc.).

- Expanding from the starting point to the rest of the drawing area, apply these rules in a drawing consisting of at least 100 iterations.
Deliverables for Exercise 1 - Assignment 1
1. Set of rules. (An interesting goal is to produce maximum variation with the minimum number of rules.)
2. A first drawing that applies your rules (letter size sheet of paper, 8.5" x 11")
3. A time lapse video demonstrating your drawing process (Due Mon Sept. 14).
4. Two more drawings, based on the studio feedback that you will receive on Monday September 7 and feedback from the drawing swap on Wednesday September 9 (due Monday September 14).

Exercise 1 - Assignment 2: Context and Concept

This week’s assignment explores the steps of (a) building a design concept and (b) framing a context within a design process. Through this assignment, you will develop the conceptual basis on which you will later design and make your functional light enclosure. In the following weeks, the rules for 2D transformations that you invented in Assignment 1 will be further discovered, refined and translated into principles for 3D transformations. The system of rules that you will create is going to lead to the production of a light enclosure fabricated from paper.

For this week, we will ask you to think of a concept for your light enclosure, and frame a context around it.

Your concept should be focused on:
- the performance of the enclosure with regards to functionality and user experience – i.e. with regards to transparency, translucency, views, optics, movement or something else.
- the fabrication technique and rules with which you’ll achieve the design and performance of the light enclosure.

Your context can be built upon inspiration from outside - existing art, product design and architecture, objects, fabrication processes or natural phenomena across various scales etc.

In the following weeks, you will be asked to translate your concept and its associated performance into volumetric explorations, and the assignments will focus on implementation and iteration of your initial concept. Thus, having a strong concept, supported by an interesting and relevant context, is very important. With this goal in mind, start by exploring a number of concepts before selecting a final one.

Deliverables for Exercise 1 – Assignment 2:
- Concept Drawings/Diagrams
- Rules/Procedures
- Physical study models
- Final Light Enclosure
- Concept/Context/Narrative statement
- Final Presentation
Exercise 2: Discovering a Concept - Measuring Devices

The second project explores the process of making and the development of a concept through discovery. In the first project you started with a concept and developed a folding process using a given material (paper) and functionality (light enclosure). In this project you will work around a given context (measurement) and be asked to come up with the sheet material and the concept for what & why you are measuring. After studying the act of measuring through history and precedents and exploring your own material system, you will be asked to invent devices that measure something. They could measure quantities, qualities or other metrics of your choice. While you should aim for precise forms of measurement, you must consider how your selected measured matter influences the means of making and formal implications of the device.

The project will start by selecting your sheet material. This can be material that is provided or any sheet-based material that you find in your environment. You will explore, play, and discover a set of procedures for manipulating the sheet material. Through this exploratory process you will start to imagine what you can measure and how you intend to measure the selected matter (by extending, by containing, by separating, by visualizing etc.) with your proposed device. You will use the sheet material to fabricate a series of measuring tests, analyze them, iterate and improve upon your design. You will build, experiment and test your process throughout the rest of the semester. At the end of this project, you will develop the concept and narrative about your measurement device, how it fits into a context, how it works and explore proposals for future applications.

Make >> Draw >> Iterate >> Concept >> Context >> Analysis/Narrative >> Present

Deliverables for Exercise 2:
- Final Measuring Device
- Final Object/s generated or left behind by the act of measuring
- Process models/Iterations
- Narrative/Context / Application of your process
- Final Video of the Measuring process
- Final Presentation
4.021 Schedule:  
**Exercise 1: (8 Weeks) The Design Process**  
**Week 1 (Sept. 2) Introduction**  
9/2  
Class Introduction / Exercise 1 Intro  
Assignment:  
Watch Abstract Series  
Develop a series of rules/procedures for your drawing and make the first drawing that executes your rules.  

**Week 2 (Sept. 7) Drawings**  
9/7  
Studio / Drawing Presentations – Review 1st Drawing  
Assignment:  
Swap drawing rules with a classmate. Make one drawing based on the rules you inherited.  

9/9  
Studio / Drawing Presentations – Review Swap Drawing  
Assignment:  
Make 2 more drawings based on your own rules, our feedback, and the drawing from the swap. Either modifying your rules each time, or keeping the same rules and modifying your implementation of the rules.  
Write your rules down and add them to your google slides presentation.  
Take a timelapse video with your phone – creating 1 of the drawings and add it to the presentation.  

**Week 3 (Sept. 14) Context & Concept**  
9/14  
Studio / Drawing Presentations  
Assignment:  
Watch Between the Folds Documentary  
Come up with 3 concept sketches for a light enclosure that relate to the performance and fabrication process for making the enclosure from paper. How does it work and how is it made? This can relate to your drawings or depart from it – but it should be similarly systematic and rule-based.  

9/16  
Concept & Context Intro / Concept Sketch Desk Crits  
Assignment:  
Refine your concepts – narrow down to 1 concept and draw it clearly (by hand/sketch)  
Concepts should be about: 1. The performance of the light enclosure in relationship to people/views/light etc. and 2. Fabrication process – how it’s made from paper, how it works.  

**Week 4 (Sept. 21) Representation & Fabrication**  
9/21  
Studio / Concept Presentations + Intro to Rhino  
Assignment:  
Refine your concept & draw your concept diagram in Rhino/Vector 2D  
Start working with paper – fold/shred/weave/etc. – experiment with the paper and start to understand how you can manipulate it to produce certain effects, textures, and performances, and how that can inform your fabrication process & concept.  

9/23  
Studio / Representation Intro + Process experiments Desk Crits  
Assignment:  
Start to use your new fabrication process and experiment with the paper - understand its formal
possibilities
Update your concept based on what you learn

Week 5 (Sep. 28) **Make**
9/28 Studio / Desk Crits + Intro Adobe
Assignment:
Continue to use your new fabrication process and experiment with paper
Update your concept diagram & revise in Adobe with line weights
Record your procedure as a series of rules/steps/systems
Prepare the presentation for the Interim review including concept diagram, vector drawing of the enclosure, precedents/concept/context and small-scale physical models.

9/30 **Exercise 1 Interim Review**
Assignment:
Make the first full-scale experiment with paper.
Update the diagrams/drawings/concept based on feedback.

Week 6 (Oct. 5) **Iterate / Analysis / Narrative**
10/5 Studio / Narrative Intro + Desk Crits.
Assignment:
Make the second pass at the full-scale paper model.

10/7 Studio + Student Presentations
Assignment:
Prepare a sketch/diagram of what you will do for your final paper enclosure. Start fabrication. Work on the diagrams/presentation and think about what the final documentation will be (photos/videos/timelapse)

Week 7 (Oct. 12) **Documentation**
10/12 Columbus Day – No Class

10/13 Monday Classes to be held- Informal Desk Crits as needed.
Continue with documentation & fabrication.

10/14 Studio / Documentation Intro + Desk Crits
Assignment:
Make the FINAL light enclosure fabrication.
Update drawings/presentation based on feedback. Start final documentation – images/videos/timelapse of the project

Week 8 (Oct. 19) **Presentation**
10/19 Studio / Desk Crits
Assignment:
Finalize presentation, do final documentation of the enclosure (photos/videos/timelapse), update diagrams, vector drawings and rest of presentation.

10/21 **Exercise 1 Final Critique**
Exercise 2: (8 Weeks) Designing a Process

Week 9 (Oct. 26) Intro
10/26 Studio / Introduction to Project 2
10/28 Studio / Desk Crits

Week 10 (Nov. 2) Make
11/2 Studio / Make - Student Presentations
11/4 Studio / Make - Desk Crits

Week 11 (Nov. 9) Draw
11/9 Studio / Draw - Student Presentations
11/11 No Class – Veterans Day

Week 12 (Nov. 16) Iterate
11/16 Studio / Iterate / Concept Desk Crits
11/18 Exercise 2 Interim Review

Week 13 (Nov. 23) No Class – Thanksgiving Break

Week 14 (Nov. 30) Concept/Context
11/30 Studio / Concept/Context Desk Crits
12/2 Studio / Concept/Context Student Presentations

Week 15 (Dec. 7) Analysis/Narrative
12/7 Studio / Analysis Desk Crits
12/9 (Last Day of Classes) Studio / Narrative Desk Crits

Week 16 (Dec. 14) Presentation
TBD Exercise 2 Final Critique
Learning Objectives:
The course consists of two projects exploring various topics through concepts, drawings and physical fabrication. Students should be able to engage with an increasing level of design research through iterative studies and move fluidly between different modes and scales of operation. Conventions of design representation and communication through drawing and modeling will be explored. Students will need to demonstrate basic application of design skills, understanding of conventions, and an ability to sustain an increasing level of research in the projects over the semester.

Statement of Required Work:
There are two main exercises that divide the semester in half. Each exercise is made up of shorter weekly themed assignments that build off one another. There are four formal reviews scheduled throughout the semester that are milestones in the sequence of the exercises.

Exercise 1 Interim Review
Exercise 1 Final Review
Exercise 2 Interim Review
Exercise 2 Final Review

Completion Requirements:
Completion of each of the exercises, 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. (01) Concept: How clearly is the student articulating the conceptual intentions? (02) Translation of Concept: How well is the student using their concept to develop a design response to given problems? (03) Representation Appropriateness: How well matched is their choice of representational means to their intentions? (04) Representation Quality: How accomplished are they with regards to drawing, modeling, digital representation, etc? To what degree does their representations convey what they ought to? (05) Oral Presentation Skills: How clearly are they presenting their ideas orally, whether at their desk, in class discussions, or to a more formal jury? (06) Participation in Discussions: How actively and how constructively are they involved in class discussions, both formally and informally? (07) Response to Criticism: How do they effectively take advantage of criticism from instructors, classmates and outside jurors? (08) Auto-Critical Skills: To what extent are they able to critique their own work regularly and effectively? (09) 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.
Studio Culture: Work in the design studio will build sequentially. Therefore, your commitment to continual development on a daily basis is of paramount importance. Although you will be working virtually this semester, we want to emphasize the importance of your peers as a source of support, inspiration, and feedback. Magnification of your development as a designer is made possible by the collective nature of the class. Group reviews are collective for a reason, as each of you has something to gain from your peers. Our virtual studio is a place for all, and it necessitates the careful attention to the needs of everyone in it.

There will be several platforms integrated into the studio to support collectivity while apart. The How to Design Slack channel will be an asset to confer with your peers and crowdsource for answers and support. Instructors and TAs will hold virtual office hours over zoom outside of the listed class time. We will also use software for virtual sketching and drawing during desk crits. Incremental assignment presentations will be uploaded to a shared google slides so you can refer back to your peers’ work throughout the semester.

Kits: Each enrolled student will receive a kit of tools and materials issued by the department. The kits will be mailed to each of you once registration has been confirmed after the first week of classes. These materials and tools should provide the basic elements needed to build your projects throughout the semester.

Attendance: Attendance for the full duration of each class is mandatory. The design studio is an exceptional learning environment that requires your presence as well as your input. You are allowed three 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. Absences beyond the three allotted will result in a decrease in your final grade. If you miss six or more studio classes, you will be asked to drop the subject or receive a failing grade.

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 professor to determine next steps. In most circumstances, students will not be excused from coursework without verification from a dean. Please visit the S3 website for contact information and more ways that they can provide support.