4.021: How to Design (Almost) Anything

Class Overview: 4.021 How to Design (Almost) Anything 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 exercises, students will develop skills of creativity, abstract thinking, representation, iteration, and design development. 4.021 is an introductory class intended for students without a design background, geared towards enabling more effective collaboration with designers, and the ability to apply foundational principles of design to any discipline. Limited to 25; preference to Course 4 and 4B majors/minors, design minors, first- and second-year students.

The Design Process:
Each week the class will explore aspects of the design process from context to concepts, drawing, making, iterating, building a narrative and finally presenting. This path exemplifies a traditional design process where a designer starts with an idea and works through testing, expanding, refining, and eventually realizing their idea for review and evaluation. Through weekly topics and assignments, students will develop a variety of design skills relating to each stage of the design path.

Exercise 1: DRIFT
The first project explores processes of drawing by looking at systems, rules, and generative principles. Students will select (or invent) a drawing tool and develop a series of rules to govern its use. These rules will become a set of written instructions that will be used by a number of your classmates, in succession, to produce a drawing. The drawing must feature an iterative process producing repetition and seriality. Students will consider how anomalies, deformations, randomness, or errors coded into the instructions might produce “drift.” The drawing tool and temporal components of the mechanics (human or other) should be carefully considered and evidenced in the drawing.

Concept >> Make >> Iterate >> Select >> Code >> Test >> Analysis/Narrative >> Present

Deliverables for Exercise 1:
- Rules/Procedures/Drawing Tool
- Iterations
- Time-lapse video
- Code/Final Drawing
- Concept/Context/Narrative statement
- Final Presentation

Exercise 2: MODULES (Note: Material and Details of Assignment Subject to Change)
Students will be asked to develop a concept that applies a fabrication technique or a method of making to the design of an aggregable module. Your aggregable module can relate to your drift drawing or depart from it – but it should be similarly systematic and rule-based. In the next stages of the project, students will use white foam in combination with at least three subtractive fabrication methods (wire cutting, carving, sanding, melting etc.) to test, expand and refine the initial rules, transforming them from rules for design into rules for making. Concepts should be focused on the performance of the module – i.e. with regards to privacy, shading, views, optics, movement etc. – and its relation to the method of making.

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

Deliverables for Exercise 2:
- Concept Drawings/Diagrams
- Rules/Procedures
- Physical study models
- 3 Final aggregable modules
- Concept/Context/Narrative statement
- Final Presentation
Exercise 3: MODULAR AGGREGATION (Note: Material and Details of Assignment Subject to Change)

The final project focuses on building a full-scale architectural element in the context of a group project. Students will build on the first two exercises, expanding their selected aggregable module into a 2'x4' architectural aggregation in teams of three people. In building at the prototype scale, students will have to address questions of structure, material, detail, tectonics, and experience. The two-sided but stationary nature of the aggregable module will be adapted in scale and function to produce an aggregation which can be viewed from multiple, moving vantage points, expanding the distortions and exaggerations of the aggregation to movement-related phenomena such as lenticular and moiré effects.

Exercise 4: DESIGNING A PROCESS

The fourth exercise will ask students to develop their own design and fabrication process moving from 1D to 2D to 3D. This 1D to 3D translation is the basis of many materials and physical things around us, for example, DNA or the translation of yarns into textiles or the use of 2x4s in the construction of buildings. This discovery-based or research-oriented design process starts by making, experimenting and testing a process, then develops a concept around what it is, why it is useful and what context it relates to. By starting with 1D materials, students will develop their own strategies for folding, creasing, weaving, braiding, felting or otherwise manipulating these materials into 2D and ultimately 3D structures. This lineage allows us to explore the fundamentals of geometry from line to surface to volume as well as think about methods of drawing and constructing objects & spaces.

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

Deliverables for Exercise 4:
- Prototype models
- Drawings
- Final Object/s
- Narrative/Context
- Final Video
- Final Presentation
4.021 Tentative Schedule:

Exercise 1: (8 Weeks) The Design Process
Week 1 (Feb. 04) Course Introduction/Assignment 1a: Drift Drawing
  02/06  Context/Concept/Sketch (Presentation + Desk Crits)
  Presentation: Course Introduction + Design Process
  Assignment:
  Study references and select one that you prefer, tell us why and about the author.
  Analyze which rules/procedures are behind this drawing and start to develop a series of
  rules/procedures for your drawing on sketch/trace paper. Think about a drawing tool or
drawing technique that might introduce “drift” into your drawing process.

Week 2 (Feb. 11) Draw, Make, and Iterate Drawings Based on a Set of Rules
  02/11  Draw/Make/Iterate (Desk Crits)
  Assignment:
  Make a first draft-drawing based on your rules on a (24"x24") sheet of Kraft paper.
  Make a second draft-drawing modifying your rules, or keeping the same rules and
  modifying your implementation of the rules, or using your drawing tool in a different
  manner on a second (24"x24") sheet of Kraft paper.
  02/13  Analysis/Narrative/Code/Test (Desk Crits)
  Presentation: How to Assemble Your Google Slides Presentation
  Assignment:
  Write your rules down for the selected iteration for others to draw it and add your rules to
  your google slides presentation. Make the last iteration of your drawing following these
  rules and take a time-lapse video with your phone – creating your selected drawing-- add
  your time lapse video to your google slides presentation.

Week 3 (Feb. 18) Follow a Set of Rules To Collectively Make a Drawing
  02/18  Presidents Day (No Class)
  02/20  Analysis/Narrative/Code/Test Group
  Assignment:
  Following the set of rules written by 4 of your classmates, work to contribute towards the
  creation of four of your classmate’s drawings.

Week 4 (Feb. 25) Represent, Present, and Review
  02/25  Final Review, Assignment 1a: Drift Drawing
  Assignment:
  Display and present your work to a group of invited jurors. Document your final
  presentations.

  Modules & Modular Aggregations Introduction/Assignment 2: Modules
  02/27  Context/Concept/Sketch (Presentation + Desk Crits)
  Presentation: Modules & Modular Aggregations
  Assignment:  (Note: Material and Details of Assignment Subject to Change)
  Study references and select one that you prefer, tell us why and about the author.
  Come up with 3 concept sketches for a module and modular aggregation. How does
  your module work individually and as part of an aggregation/system? How does it
  perform? How is it made? Your module aggregation can relate to your drift drawing or
  depart from it, but should be similarly systematic and rule-based.
Week 5 (Mar. 04) **Draw, Make, and Iterate**

03/04 Draw/Make/Iterate (Desk Criots)

Presentation: *Introduction to Rhino + Laser Cutting*

Assignment: (Note: Material and Details of Assignment Subject to Change)
- Refine your concepts – narrow down to 1 concept and draw it clearly (by hand/sketch)
- Concepts should be about 1. The performance of the module in relationship to people/views/light etc. and 2. Fabrication process, i.e. how it’s made, how it works. Cut your 1’x2’ foam block into 6”x6” modules
- Start working with the foam – cut/melt/glue/break – play with the foam and start to see how it behaves and how that can inform your concept & fabrication process. Try at least three subtractive fabrication methods (wire cutting, carving, sanding, melting etc.)

03/06 Draw/Make/Iterate (Desk Criots)

Assignment: Start to use your new fabrication process and experiment on small pieces of foam.

Update your concept based on what you learn. Refine their concept & draw your concept diagram in Rhino/Vector 2D. Record your procedure as a series of rules/steps/systems

Week 6 (Mar. 11) **Iterate/ Represent, Present, and Review**

03/11 Draw/Make/Iterate (Desk Criots)

Assignment: Finish and select your three best modules and draw them in 2D.

Add them to the presentation.

03/13 Final Review, Assignment 2: Modules

Assignment:
- Display and present your work to a group of invited jurors. Document your final presentations.

**Modules & Modular Aggregations Introduction/Assignment 3: Modular Aggregation**

Week 7 (Mar. 18) **Context/Concept/Sketch/Group**

03/18 Form Groups/Consolidate 3 Ideas Into One (Desk Criots)

Assignment: Form groups of 3 students. Conceptualize and sketch how the module ideas of each student can be consolidated into a single idea for a 2’x4’ modular aggregation designed, fabricated, and drawn by a group of 3 students.

03/20 Draw/Make/Iterate (Desk Criots)

Assignment: Prepare sketches, drawings, and mock-ups of modular system describing both the individual modules and the larger completed system.

Week 8 (Mar. 25) **Spring Break**

03/25 Spring Break (No Class)

03/27 Spring Break (No Class)

Week 9 (Apr. 01) **Iterate/ Represent, Present, and Review**

04/01 Studio / Desk Criots

Assignment: Fabricate individual modules and aggregate into a system. Prepare a movie to describe the performance of your modular system, upload presentation to google slides

04/03 Final Review, Assignment 3: Modular Aggregation

Assignment:
- Display and present your work to a group of invited jurors. Document your final presentations.

**Assignment 4: Designing a Process**

**Exercise 2: (7 Weeks)**

Week 10 (Apr. 08) **Intro/Make**

04/08 Studio/Assignment Introduction

04/10 Studio/Make Desk Criots

Week 11 (Apr. 15) **Make/Draw**

04/15 Patriots Day (No Class)

04/17 Studio/Make Desk Criots

Week 12 (Apr. 22) **Draw/Iterate**

04/22 Studio/Dave Desk Criots
Learning Objectives:
The course consists of four 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.

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 student’s 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 drawing, modeling, and/or digital representation? To what degree do 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 studio will build sequentially. Therefore, your commitment to continual development on a daily basis is of paramount importance. 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 class. Group reviews are collective for a reason. Each of you has something to gain from your peers. Since studio is a place for all, it necessitates the careful attention to the needs of everyone in it. Please see your instructors if there are any problems that you are unable to resolve on your own. All spraying of fixative, spray paint or any other substance should be done inside the shop spray booth.

Attendance: Attendance for the full duration of each class is mandatory. The studio is an exceptional learning environment that requires your physical presence as well as your intellectual presence. 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.