Class Overview: This class introduces students to the creative design process through acts of making & breaking. The studio environment provides a dynamic laboratory to explore ideas related to form, space, materials, systems, and structures through physical, project-based activities. This class emphasizes the translation of concepts into constructs—thinking through making, and making through thinking. This course is specifically created to play off of students’ non-design education by introducing a domain of investigation whereby students can learn to design through the lens of cross-disciplinary experimentation. Three primary exercises will help develop student’s techniques of drawing, fabricating and building.

The Spring 2020 incarnation of 4.022 will feature Thomas Heatherwick as a visiting recurring critic for the class.

Part I: Warm-up [2 weeks, solo work] Feb 3 - 17

DRAW: Serial Drift
The first project explores processes of drawing by looking at systems, rules and generative principles. Students will look at precedents from Sol LeWitt, Josef Albers, Julio LeParc, and other practitioners who have engaged in serial drawing projects. Projects will be generated in Rhino and Grasshopper, and executed on pen plotters in a variety of media.

Drawings must feature an iterative process producing repetition, seriality, offset, displacement and/or slip.
Consider how lines interact within the script as well as how they are executed by the pen plotter.
Variables within the script may determine how lines trim, offset, occlude, reinforce, repeat, obfuscate, hatch, or multiply.
Variables within the execution of the drawings by pen plotter may include speed, draw order, blunting over time, or force.

Drawings should exhibit concepts of division, sequence, hatch, fill, moiré, or progression. How are you acting to divide the sheet of drawing paper? How are various lines, marks, imprints and/or incisions interacting with one another? How do various parts affect a larger whole? How do successive lines interact with each other? This drawing, as any other in architectural design, is a tool of exploration.

Quantity of iteration is critical for serial drift to emerge. While variations between one drawing and the next in the sequence may be subtle, each variation must be annotated and produced on the pen plotter. Students will execute drawings for every session during this exercise.

FINAL REVIEW: Feb 17

Part II: Interpret [4 weeks, teams of 2-3] Feb 19 – March 18

RESEARCH: Precedents and Affects
Students will each be assigned one adjective from a list of 10 (buoyant, massive, ethereal, pliant, rigid, precarious, tensile, compressive, etc.). Students will each prepare a booklet of 100 design precedents that exemplifies their assigned word. Similar sample bodies of precedent research will be provided by Heatherwick Studio to assist students in this process. The aim of this exercise is to rapidly expose students to the wider discourse and history of design, and rapidly exorcise them of clichés.

PROTOTYPE: Physics Fabricator
The second project explores processes of making, breaking or recursive production through a physical, three dimensional system. The notion of systems, rules and generative principles as formative design processes explored in the first exercise is expanded from drawing to object.
Students will construct a Physics Fabricator: a construct that uses relatively simple analogue processes or movements to translate deceptively simple relationships into complex form. The aim is not to simply produce 2.5D laminations of two dimensional processes, but to produce a system that is fully three dimensional in both input and output.

Investigations may focus on particular material properties and behaviors, emergent principles or patterns such as decay or resonance, or geometrical transformations. The object is not a construct that produces a standardized object, but a construct that can produce variable outputs in response to calibrated inputs. Generative processes are able to change and develop through time, expressing a myriad of possible results and forms.

Students will be asked to produce/select 5 final outputs or objects, each exemplifying one of the 10 adjectives from the previous research phase.

In this process, students should engage questions of both material/fabrication research, and become comfortable with applying internally/personally driven value systems by which to evaluate those outputs, forming an iterative cycle of research and self-critique.

**FINAL REVIEW: MARCH 18**

*Part III: Connect [6 weeks, teams of 5-6] April 1 – May 15*

**BUILD: Structures**

Students will expand exercise 2 into large installation scale spaces that facilitate an articulated form of human connection/interaction. This is an opportunity to engage Thomas Heatherwick’s ideas of the hyper-physical as a means to resist the hyper-digital. Students can incorporate precedents of existing digital isolation or dysfunction and articulate an argument for its amelioration through their physical installations.

Students will be able to select a series of public spaces that will be the ideal sites of deployment, where the pavilion will serve to transform the space, foster re-engagement, or change human interactions within the space.

Students each select one quality and one fabrication process from the previous exercise and are tasked with adapting it into an occupiable large-scale object: a pavilion. This pedagogy can be gamified as in a deck of cards each inscribed with one of the above qualities/affects/experiences and fabrication processes.

Previous warm-up exercises in drawing and fabrication could be treated as a body of research for the entire class that any member of the class can feel free to sample from -- so that students can be free to propose whatever material, technique, or process they like and not be bound by their previous individual results.

**Heatherwick Visits**

April 1, 2-5pm: First half of session: begin with the pre-recorded video introduction from Thomas, followed by presentation by Stuart exploring more deeply the critical design approach in their studio -- show the students a sample booklet of site research, or the way in which they critique a brief, in order to kickstart the students’ own similar research. Second half of session devoted to critique of previous interpret exercise

April 22, 2-5pm: Thomas and Stuart can review intermediate progress on the installations -- prototypes, material tests, analysis, etc.

**PRESENTATION OF FINAL PROJECTS WITH THOMAS HEATHERWICK: MAY 11.**

**FINAL DOCUMENTATION DUE: MAY 15**
Learning Objectives:
The course consists of three projects exploring various topics through drawing, physical fabrication and large-scale building. 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) Thesis: How clearly is the student articulating the conceptual intentions? (02) Translation of Thesis: How well is the student using their thesis 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, 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 studio will build sequentially. Therefore, your commitment to incremental development on a daily basis is of paramount importance. It is important that you take advantage of the studio environment. You have been given a studio space; please use it. Magnification of your development as a designer is made possible by the collective nature of the studio. Working in studio, instead of at home, will allow you to participate in the dialogue of the studio setting. 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 in the shop. Security is a necessary component for a studio that is accessible to you and your colleagues 24 hours a day, 7 days a week.

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.