Course overview
The course is an introduction to Design techniques and technology from the perspective of computational design. The goal is to develop an understanding of the relationship of design media and the processes of translation from ideas into designed artifacts. The introduced techniques range from geometric modeling for fabrication to programming for design and basic electronics for interactivity. As form and programmed behavior merge in design, design extends beyond the formal description of the physical artifact into the behavioral.

A series of three assignments develops design ideas build on interaction and the human body and progressively build to a final spatial installation – adapted to a more modest scale for remote learning this semester. The assignments share a focus on relating design to human behavior and encourage students to keep design processes open to change. The first assignment is a fast paced introduction to fabrication as design, the second assignment an introduction to a visual generative process using programming, the third a spatial design to enclose the human body with an interactive electronic component and a final assignment to construct a further developed version of an enclosure with the option to work alone or in group of two.

The course will rely heavily on prototyping in different design media from programming in processing to physical prototypes and fast design iterations. The focus is on finding design expression in each medium and developing design fluency not on expert knowledge.

Assignment summaries – full detail handouts at the beginning of each Assignment

Assignment 1 – Creating a physical self-portrait using 3d scanning and home-based fabrication/assembly of found parts
Length: one week
A Fast paced startup assignment - students are 3d scanning their heads using digital photometry to produce a 3D mesh as a basis for fabricating a physical self-portrait from existing and home fabricated parts using the rhino model - paying careful attention to what is build and what is implied through light and shadow and material choices and geometry - fast intro to fabrication as design using photometry, Rhino and fundamentals of design expression.

Background reading references

Assignment 2 - generative drawing using programming
Length: Two weeks
Intro to generative design using programming in processing. Identify an environmental phenomenon as a starting point. Develop a simplified model of your observation through abstraction of the key parameters and use it as a starting point for a visual generative drawing output through pixel-based images and an interactive experience. Experiment with pixel based, time based, and paper-based (optional) outputs of your drawing machine and reflect on the essence you captured from your initial observation.

Background reading references:
Casey Reas, Ben Fry, (2014) Processing
https://processing.org/tutorials/
http://www.openprocessing.org/
D’Arcy Wentworth Thompson (1942), On Growth and Form
Burry, M., Scripting cultures, Architectural design and programming, Architectural Design Primers
Gombrich (1960) Art and Illusion
Wiedemann, J. Sandra, R. (2019) History of Information design

Assignment 3 – a three-part Assignment
Assignment 3A – a one-person enclosure
Length: four weeks
Individual assignment to design a one-person enclosure. An enclosure can range from body scale to architectural scale, how does it frame the space around a person, mediate the environment, define space? Introduction to rhino and grasshopper for generating a geometry for scale model fabrication and a basic visualization/image building representation of the idea for midterm presentation.

Background reading reference examples:
Heschong, L. (1979) Thermal Delight in Architecture
http://www.rhino3d.com/tutorials

Assignment 3B – expanding the concept into interactivity
Length: 2 weeks
Identify an aspect of your enclosure design to be developed interactively using Arduino with basic sensing and actuation and implement it as a selective prototype of your design

Background reading reference examples:
Fox, Michael, Kemp, Miles, Interactive architecture, Princeton Architectural Press
www.pneubotics.com
Benjamin, D (2018) Now We See Now: Architecture and Research by The Living

Assignment 3C - final Project – (1-2 students per project)
Length: 5 weeks
Development of an inhabitable micro-enclosure with an interactive element/ alternatively develop a geometric simulation. Individual (or optional 2 student group work) developing an enclosure design concept for full scale prototype for the final presentation

Background reading reference examples:

Schedule
Both Lab (Mondays) and Studio (Wednesday) days will be held online via Zoom and miro with slack and other tools as needed to support online collaboration. Presentations and progress updates are to be submitted in the studio dropbox folder before studio starts that day and presented to the class for discussion and feedback – desk crits are one on one discussions in break out rooms via zoom of your design development with new material prepared by you for discussion

Week 1 (Aug. 31)
9/2 Studio - Studio Introduction – Intro Assignment 1 Portrait – Tool kit orientation

Week 2 (Sep. 7)
9/7 Lab - 3D scanning – paper printing/cutting, measuring parts
9/9 Studio -Final Presentation Assignment 1 - Intro Assignment 2 – generative drawing

Week 3 (Sep. 14)
9/14 Lab –Programming in Processing
9/16 Studio – Progress update presentation Assignment 2

Week 4 (Sep 21)
9/21 Lab – Visual output in Processing
9/23 Studio - Final Presentation Assignment 2 – Intro Assignment 3A– one-person enclosure

Week 5 (Sep 28)
9/28 Lab – intro Rhino - Grasshopper
9/30 Studio – Progress update Presentation Assignment 3A– one-person enclosure
Learning Objectives:
The course consists of three projects exploring various topics through generative drawing using programming, physical fabrication, basic electronics and prototype 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 assignments, 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 in online discussions, 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. (10) Group work – contributing to the group dynamic and willingness to collaborate

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 online support tools like zoom, slack, maker kit and miro. If possible, create a small space in your work environment dedicated to studio work and use it. Frequent progress updates for sharing your developing work with your peers and your development as a designer is made possible by the collective nature of the studio. We will try to encourage working alongside through zoom breakout rooms in the lab session, to encourage you to develop a dialogue with your peers in the studio setting. Group reviews are collective for a reason. Each of you has something to gain from your peers. When working from home please take extra care to follow all safety protocols outlined in the MIT EHS remote making web site https://wikis.mit.edu/confluence/display/make/Remote+Making. Safety is crucial in all you do, also remotely especially if immediate supervision and advice by shop managers is not available – if in doubt please stop and reach out for advice first.

**Attendance:** Attendance for the full duration of each class is mandatory. The studio is an exceptional learning environment that requires your zoom 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.