Cultures of Form
CREATIVE COMPUTATION

MIT ARCHITECTURE
ARCH 4.105
FALL 2025
R 9:30 – 12:30
RM 5-234
CREDITS: 2-2-5 G

Syllabus

INSTRUCTORS

Brandon Clifford (Instructor) - bcliffor@mit.edu
Mariana Popescu (Instructor) - madpope@mit.edu
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OVERVIEW

Architecture has a deep history of integrating drawing and making, fluidly moving between the two modes. But the Albertian orthographic mandate produced a schism in this reciprocal relationship. It relegated architects to producing representations of architectural intent, relinquishing the means and methods of making to builders. With advances in digital technologies, this relationship is once again entangled. In doing so, it brings into question the renewed roles of architects, designers, creators, computers, and makers. This course disputes the default compartmentalization that is present in architectural practice today. Through the tools of computation and fabrication, the course empowers students to design as architect, engineer, and craftsperson.

This course employs modes of computation that bridge between the virtual and physical worlds. In doing so, students learn the fundamental principles of reciprocal computation, enabling a design process that operates in reciprocity with means and methods of making. Students will operate through short exercises that build toward larger projects. The semester is structured into two modules: one in the first half of the semester, and another in the second half, each culminating in a project.

STRUCTURE

The course is divided into two major parts:

Part I: Crop Circles (Instructor: Brandon Clifford)

In an era when GPS, laser measurements, and lidar equipment are ubiquitous, little knowledge exists surrounding the task of scaling precise geometric operations without the reliance on advanced technology. How does one draw two parallel lines in a field with just string? What could we learn today, by looking back to moments of the past when humans were adroit in deploying string-based geometries to address landform surveys? Some precedents include the stone circles of northern Europe, the Nazca lines of South America, the celestial alignments of Mayan cenotes, or even the crop circles of the previous century.

This part of the course builds upon a range of fundamental methods developed in the *Crop Circle Kit* (cropcirclekit.org). Students will confront the challenges of translating rule-based geometries at their desks into colossal drawings in the field, overcoming the incremental tolerances of the physical world at scale. Shorter exercises (one- and two-week durations) will establish computational rules, preparing students to carry out a larger culminating project.

Part II: Tensile Structures (Instructor: Mariana Popescu)

Textiles have a longstanding tradition within architecture, providing shelter for millennia. They are characterized by being lightweight and portable, which makes tensile structures versatile for spanning large spaces with minimal use of materials. These types of structures are commonly seen in urban shading systems, stadiums, temporary shelters, and other applications.

The geometries of such structures can be designed using form-finding principles, which have been developed since the 19th century. These methods began as physical form-finding experiments and were later translated into mathematical principles that evolved into computational models for generating 3D geometries with commonly available software. During this part of the class, we will explore both physical and computational form-finding methods through a series of exercises that help students understand the relationship between digital design and making.

Evaluation Criteria and Grading

The following criteria will be used for the evaluation of your work, both in terms of helping your progress and in final grading:

- Investigation: How rigorous are your investigations?
- Translation of Investigation: How clear are your findings communicated in your presentation of your investigations?
- Presentation Quality: To what degree do your presentations convey what they ought to?
- Participation: How actively and how constructively are you involved in class discussions and exercises?
- Contribution: To what degree do your findings constitute a contribution to the class, field, or larger context? To what degree are those findings novel?

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, modelmaking 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 more than two unexcused absences.

Policies

Attendance at all class meetings is mandatory. If any meeting (lecture or workshop session) is to be missed, please notify the instructor prior to the scheduled class. Please remember to silence cell phones and be courteous when using laptops in class. This course is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with the faculty member/department administrator early in the semester so that accommodations can be implemented in a timely fashion.

Undergraduates: If anything is getting in the way of your academics, please consult with S3 (s3-support@mit.edu). The walk-in queue is open from 10-12 and 2-4 on weekdays. Appointments can be virtual or in-person, depending on your comfort and convenience.

Graduates: A variety of issues may impact your academic career including faculty/student relationships, funding, and interpersonal concerns. In the office of

Graduate Education (OGE), GradSupport provides consultation, coaching, and advocacy to graduate students on matters relating to academic and life changes. If you are dealing with an issue that is impacting your ability to attend class, complete work, or take an example, you may contact GradSupport by email at gradsupport@mit.edu or via phone at (617) 253-4860.

The MIT online course management system (Canvas) will be used exclusively in the course. Lecture handouts and exercise descriptions will be available there shortly after class is held. Students will also be submitting exercises and materials through this system and must do so by the assigned due date.

Readings

Carpo, Mario. “Introduction.” *The Alphabet and the Algorithm*. Cambridge, MA: MIT Press, 2011.

Emmons, Paul and Jonathan Foote “Making Plans: Alberti’s Ichnography as Cultural Artefact.” In Sharr, Adam. *Reading Architecture and Culture: Researching Buildings, Spaces and Documents*. London: Taylor and Francis, 2012.

Emmons, Paul. “Footprint Plans.” *Drawing Imagining Building : Embodiment in Architectural Design Practices*. Abingdon, Oxon ;: Routledge, 2019.

Thom, Alexander. *Megalithic Sites in Britain*. Oxford: Clarendon Press, 1967.

Schedule

9/4	Introduction	Ex. 1a
9/11	Field Day – Line Extension	Ex. 1b
9/18	Desk Workshop & Parametric Intro	Ex. 1c
9/25	Workshop	
10/2	Field Day – Drawing 1	Ex. 1d
10/9	Workshop	
10/16	**REVIEW** – PART I	
10/23	Introduction – Part II	Ex. 2a
10/30	Workshop – Computational form-finding	Ex. 2b
11/6	Field Day – Physical vs Digital	
11/13	Workshop – Cutting Patterns	Ex. 2c
11/20	Workshop – Visualization	Ex. 2d
10/27	HOLIDAY – Thanksgiving	
12/4	*Optional Resource Day*	
12/TBD	**REVIEW** – TBD	