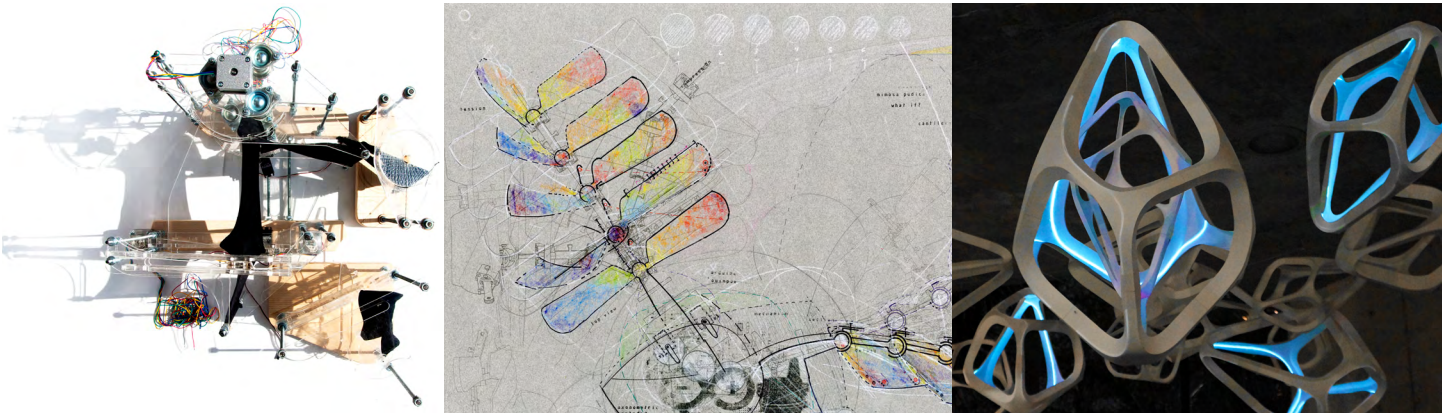


UF|SOA FALL 2016 ARC 6912/4930 SEMINAR: SENSE-ABLE CONSTRUCTS



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Co-Lab	ARC 411	Mon   5	11:45 AM - 12:35 PM	ARC 6912 Section 1G52 (Graduate)
		Wed   5-6	11:45 AM - 1:40 PM	ARC 4930 Section 257E (Undergraduate)
				Prof. Lee-Su Huang
				Office: ARC 240
				Email: leehuang@ufl.edu

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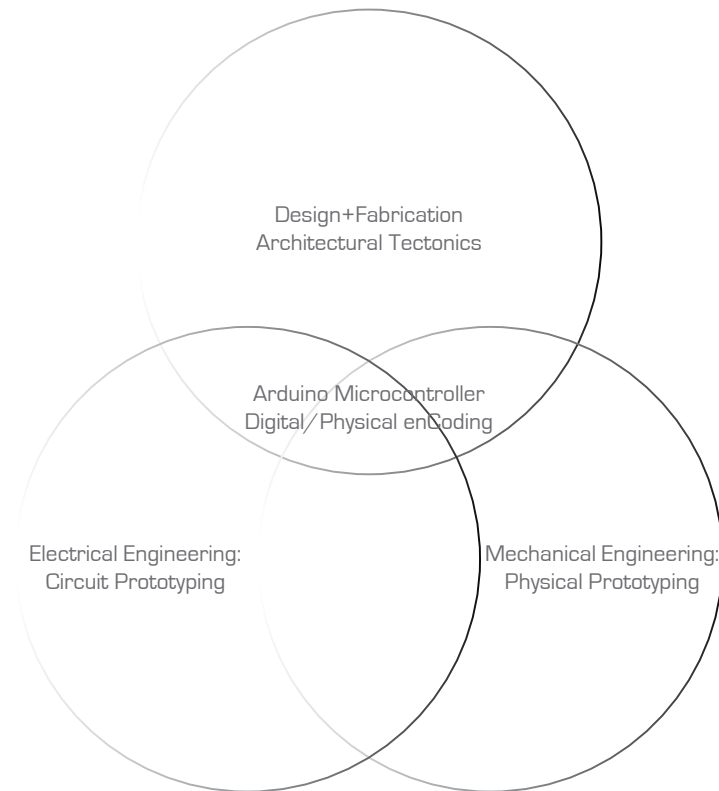
Open source development paradigms have revolutionized the way the world develops software, hardware, products, research, and even funding. What has traditionally been the sole purview of mega-corporations and large industrial complexes in project development has been slowly overtaken by the grass-roots startup "Maker Movement". Made possible by open source hardware and software, these rapid-prototyping technologies substantially lower the barrier of entry to the research and development of complex integrated systems, in both the physical and digital realms.

Given the above premise, this seminar will explore the potential applications of open-source rapid-prototyping technology platforms to the design and fabrication of full-scale interactive architectural constructs, with the following three primary focuses:

1. The application of digital modeling techniques in the design, simulation, and rationalization of architectural geometries, including but not restricted to parametric design logics, form-finding algorithms such as Kangaroo for tensile and catenary geometry structures, and the design of complex developable surfaces.
2. The fabrication of above geometries in full scale and real materials, incorporating techniques both analog and digital, while negotiating real-world parameters such as cost, logistics, sheet size, weight, and structure. Experimentation into methods of joinery will be critical to the success of the seminar, as well as the optimization of production methods and waste minimization. As such the seminar will leverage the precision and repeatability of digital fabrication, in particular the laser cutter for small-scale tests. An introductory workshop on the use of the CNC mill will be conducted for production purposes, and to a lesser extent the Mak-erbot PLA 3D printers for small-scale joint fabrication possibilities.
3. Prototyping interactivity, made possible by the Firefly plugin for Grasshopper and the Arduino microcontroller, elevating the architectural installation into a construct that responds and reacts to environmental stimuli or human occupation. Workshops on simple sensors, actuators, and electronic circuits will be carried out to facilitate explorations into these possibilities.

This will be a highly production focused, workshop-based seminar with a lot of physical and digital prototyping, fabrication, and weekly iterative testing. These will be built as full-scale physical prototypes, with large-scale speculative deployment represented in drawings and perspectives. The seminar will culminate in full-scale architectural installation(s) at the end of the semester in the Architecture building Atrium or Gallery, schedule and permits allowing.

In addition, these proposals will be developed in small teams and submitted to the 2017 AIA SPP Small Project Design Competition - POP-UP 2017 - REFLECTION. Winning proposals will be funded for construction and exhibition at the Convention floor, as part of Town Hall, during the 2017 AIA National Convention in Orlando, FL - April 27-29, 2017. Award winning projects will be recognized in AIA publications and electronic media, including the SPP Review and website.



### Requirements:

- Experience with Rhino is advisable; experience with Grasshopper helpful but not required; Firefly is very different from “normal” Grasshopper. Students are responsible for bringing a laptop (with Rhino+Grasshopper+Firefly installed) to all class sessions.
- A FabLab account will be required for all students in order to complete project development and assignments.
- Hardware Required: Laptop capable of running Rhino, Grasshopper+Firefly, Arduino Software (<http://arduino.cc>).
- Basic Arduino Kits and commonly used components will be provided for workshop purposes.
- A class purchase of basic components will be coordinated for discounted prices.

A variety of sensors, Leap Motion controller, as well as a Microsoft Kinect V2 will be provided for testing. Also available will be a range of large servos, stepper motors, as well as a compressor, pneumatic pistons, and solenoid valves for developing full-scale actuation. A Makerbot Replicator 2 PLA 3D-printer will be made available for prototyping custom components.

### Course content:

- 01\_Grasshopper fundamentals, Firefly plugin for Grasshopper
- 02\_Interactive circuit prototyping with the Arduino Microcontroller and Arduino IDE (Integrated Development Environment)
- 03\_Precedent study of flexible geometries, mechanical, and biological precedents
- 04\_Case studies of contemporary kinetic architectures and interactive installations
- 05\_Fundamentals of CNC fabrication (2D and 3D)
- 06\_Material prototyping and joinery development
- 07\_Sensing, Reacting, and Actuating with Arduino and basic electrical circuits
- 06\_Digital Fabrication (2D and 3D) of kinetic assemblies
- 09\_Design and fabrication of physical interactive prototypes
- 10\_Speculation and documentation of large-scale prototype deployment

Experience with Rhino is advised; experience with Grasshopper helpful but not required. Students are responsible for bringing a laptop to all class sessions. Class will be conducted in the Co-Lab ARC411 as a collaborative educational experience.

## Course Deliverables:

\_Attendance: [10%]

\_Class Assignments: [15%]

\_Mid-Term Project: [25%]

Kinetic Prototype Development Models (Group)

\_Final Project: [50%]

Kinetic Prototype Full Assembly+Representation (Group)

Gallery/Atrium Exhibit: Tentatively scheduled for early Spring 2017.

Small Project Competition Proposals:

Alternatively further development of proposals for 2017 AIA Convention in Orlando.

## Grading Scale

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Numeric Grade	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59
Quality Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0

Late and /or incomplete work will not be accepted. Attendance, participation and discussion in class is mandatory. Three unexcused absences will result in a full letter grade deduction, while four or more unexcused absences will result in an automatic "E" semester grade. Unexcused late arrival or early departure from the seminar is unacceptable and will automatically count as an absence. Plagiarism will not be tolerated, and will result in a failing grade for the semester.

## UF Policies

### UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

### UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:

Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at <http://www.dso.ufl.edu/students.php>.

### \*\*NETIQUETTE: COMMUNICATION COURTESY:

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. [Describe what is expected and what will occur as a result of improper behavior]  
<http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf>

### UF GRADING POLICY

Information on UF's grading policy can be found at the following location:  
<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

Disclaimer: This syllabus represents my current plans and objectives for the course. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.

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