University of Texas
Collaborative Teaching by the Department of Computer Science and the School of Architecture

**BIO-(In)Formatic Modeling**
*In Architectural Design*

ARC 350R/ ARC 386M/ CS 378
Spring 2016

Instructors: Professors Chandrajit Bajaj (Computer Science) and Danelle Briscoe (Architecture)

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**Overview**

Through technological innovation based in biological systems, the disciplines of architecture and computer science unexpectedly come together. This seminar is a cross-disciplinary course awarded by the University of Texas Collaborative Teaching Grants that will research, model and fabricate biological systems, specifically focusing on those of Central Texas. The course will translate the potentials from two schools, the Department of Computer Science (CS) in the College of Natural Sciences and The School of Architecture (UTSOA), to initiate student design proposals that examine the appearance, performance and associated factors from appropriate biological data.

Mathematical modeling and computer simulation of artificial life investigated in CS can enhance the depth of living systems in architecture and their unexplored design potential. The innovative combination of computer graphic platforms commonly used by each of the disciplines, such as Lindenmayer system (or L-system) for CS and information modeling for architecture, will be creatively put in conjunction in order to control geometry, planting data research, as well as in-depth physical patterning of selected native plant species to meet their building and construction potential.

The synthesis of two seemingly distinct worlds - the digital and the material- generates new, self-evident realities.  - Digital Materiality in Architecture, Gramdo + Kohler
For architecture, a living wall—comprised of plants rooted in growing media attached to the wall itself—holds environmental benefits and potential for buildings and structural partition walls. For computer science, biological systems offer data to geometrically model and visualize multi-scalar aspects of nature, from the varied branching structures of plants and trees to the circulatory blood vessels network and forests of neurons. The fundamental algorithms in the intertwined topics of computational topology, geometry, and segmentation approximations will serve as the means to growing shells or branching structures to support plants at multiple levels on a wall.

The project-based assignments and content will also focus on the role of biological morphologies in relation to fabrication processes. All assemblies will be designed in an associative environment and iteratively tested utilizing digital (laser-cutting and 3D printing) fabrication equipment. The objective will ultimately serve to develop a generative design strategy for architectural design through specific workflows of fabrication methods. The use of Rhino/Grasshopper/Rabbit will be explored with some later development using Python and Revit BIM. Experience with the software is beneficial but not mandatory. Ideally, students from each school will be paired to form collaborations of development and understanding of the topics at hand.

**Requirements**

**Class times**

9:30-11am MW, West Mall Building 1.114
Lab 9-11am Tuesday

**Office hours:**

Bajaj 1pm - 3pm Monday (or by appointment)
Briscoe 9am - 11am, Tuesday (or by appointment)

**Contact**

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**Evaluation**

10% Participation

85% Project Topic General
(15%) 1: Patterns of Growth surface articulation diagram
(30%) 2: Plant Symbiosis plant based symbiotic growth map
(40%) 3: Growth Structure continued research with 3D printed investigation