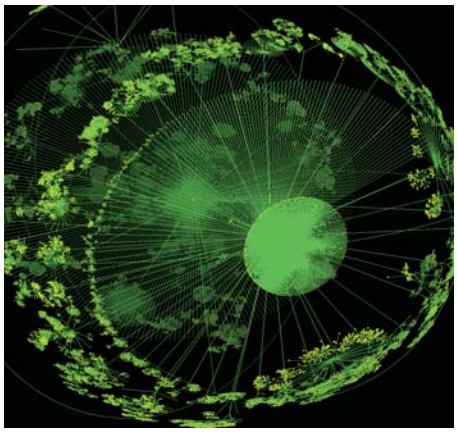
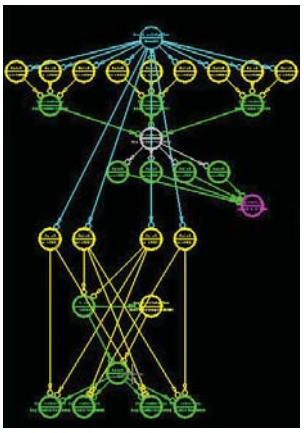
HERBERGER INSTITUTE FOR DESIGN AND THE ARTS - SALA

ANP 494/598 DIGITAL ECOLOGIES //SPRING 10

Inst: David Newton // DAVID.NEWTON@ASU.EDU // Office Hours: by appointment // THUR 4:40pm – 7:30pm CPCOM 107, 3 cdts



Walrus Map of the Internet



Parametric model: Component Membrane

AA Component Membrane, 2008

"Because design is a way of thinking intrinsically weaved with the most existential human characteristics, that of logic, artificiality, creativity, and identity, algorithms serve as the means to explore beyond, in parallel, or in lieu of traditional established ways of thinking...In such a synergetic relationship the unpredictable, impossible, or unknown are not factors of fear but rather invitations for exploration." - Kostas Terzidis 'Algorithmic Architecture'

Digital - A digital system is a data technology that uses discrete (discontinuous) values. By contrast, non-digital (or analog) systems use a continuous range of values to represent information.

Ecology - The totality or pattern of relations between organisms and their environment.

Network - An interconnected or interrelated chain, group, or system

COURSE INTRODUCTION

This course will explore the potential of systems theory and parametric modeling to produce designed objects at multiple scales. Throughout the term the seminar will be focussed on the design of systems not things; on the design of the relations between elements not only the elements themselves; on the design of thinking and deductive structures not explanations; on the exploration of solution spaces and not just particular solutions. Therefore, the computer will be explored in terms of its capacity to generate designs and not just as a tool to represent designs.

Through several investigations, students will learn how to conceptualize, design, and technically construct simple relational/parametric models in Rhinoceros 3D that can output populations of designs for comparative study. In addition, weekly lectures and readings will provide a theoretical context for key concepts in the course and also situate those concepts within contemporary architectural design practice. No prior experience in these platforms is necessary.

When the seminar is concluded students will have a technical knowledge to design simple to intermediate level parametric models and scripts in Rhino capable of generating designed objects. Students will also learn how to use basic digital fabrication technologies, such as the laser cutter and the 3D printer, to fabricate their designs.

COURSE AGENDA

Prerequisites
Open to Undergraduates and Graduates in the School of Architecture and the Herberger Institute of Design.

Learning Objectives
At the end of the course students should be able to:
1. Use Rhino effectively to create simple to intermediate level parametric models.
2. Use Rhino effectively to create simple scripts.
3. Use Rhino as a fabrication interface for the laser cutter and the 3D printer.
4. Have an introductory to intermediate understanding of the theoretical and historical issues relating to parametric and algorithmic architectural design.
5. Document and present their work using Adobe Illustrator, Photoshop, and InDesign.

Modes of Inquiry
Through several investigations, students will learn how to conceptualize, design, and technically construct simple relational/parametric models in Rhinoceros 3D.

Materials and Costs
This seminar will be based primarily in Rhino and the school has copies of it in the labs. Costs for digital fabrication and materials throughout the semester will very, but should be less than $100 (less than the cost of a good textbook).

Expected Outcomes
Students will produce a series of parametric models, scripts, and designs throughout the term and fabricate some of them using the laser cutter of the 3D printer. Students will also document their investigations through the production of a digital portfolio, as well as, a web-based portfolio.

COURSE STRUCTURE

Lectures/Technical Tutorials – Throughout the semester lectures will be given on various topics related to parametric and algorithmic design in relation to architecture, as well as, specific case studies. Technical tutorials on digital representation and computer modelling will be given as well. Technical tutorials will often be given in the form of instructional videos uploaded to the blog.

Readings + Discussions – Readings will be assigned throughout the semester for students to read, take notes on, and discuss. Each week specific students will be assigned to lead a class discussion on the readings for that week. Students will be able to view readings off the blog. No texts are required.

Lab Session – Lab sessions are dedicated time in class for students to work on their projects, present their work informally to the class, go through video tutorials, and address individual questions to the instructor. Lab sessions are also an opportunity for the student to present his/her work to the instructor and get feedback on a one-on-one basis. Attendance is mandatory unless otherwise excused.

Projects - Throughout the term each student will work individually and sometimes in teams to complete 4 major projects based on issues of parametric and algorithmic design.

In Class Pin-Ups and Reviews – At the end of each project students will be asked to present their work to the rest of the class and sometimes to invited guests as necessary.

Final Exhibition - Depending on availability of space, we may have a final exhibition of the best work for public display.

POLICIES

Attendance:
Attendance at all classes is expected. All excuses, to be submitted for approval, are to be in writing. (The University and School of Architecture have no provision which allows for unexcused absences or tardiness.)

Grading:

Activity % of final grade

Project 1	15%
Project 2	15%
Project 3	15%
Project 4	30%
Participation/Blog Assignments	5%
Readings	10%
Portfolio	10%
Total	100%

Final grades will be based on the following University Grading Policy:

Grade points	
A outstanding work	90-100
B more than required	80-89
C meets requirements	70-79
D less than required	60-69
F failed, insufficient work	60 or below

Late Work
No late work will be accepted, except in the case of bona fide emergencies. Giving some students extension is unfair to them and to others.

Incompletes
Incomplete grades are rarely given. They are only given in case of documented health or family emergencies AND when the semester's work is already substantially complete (roughly 85%).

Portfolio Requirement
Students are expected to submit a summary of the semesters work in portfolio format produced under the guidance of the instructor.

ACADEMIC POLICIES

GRADING PERCENTAGES BY COURSE

Students should carefully review the specific learning objectives for their seminar as well as the general description of what each grade reflects (see below); these are the criteria that will be used when assigning all grades.

General Grading Standards for the Program

"A+", "A", "A-"

Excellent work not only fulfills the stated objectives of the course syllabi and project statements, but extends them through new discoveries, insights and proposing issues beyond their stated scope. These students demonstrate a high degree of professional dedication, rigor, a love of exploration, open mindedness and resourcefulness. They have developed the ability to build upon a variety of feedback and excel independently. Their resultant work is rigorously thought through, well crafted and clearly communicates the breath and depth of their daily investigations.

"B+", "B", "B-"

Outstanding work not only fulfills the stated objectives of the course syllabi and project statements, but also further expands the stated issues by allowing those issues to direct their investigations and developments in their work. These students demonstrate a medium degree of professional dedication, inquisitiveness, systematic rigor and limited resourcefulness. They are developing the ability to build upon a variety of feedback and their emerging independent voice. Their resultant work is competently thought through, well crafted and clearly communicates the breath and depth of their daily investigations of the issues presented in the projects.

"C+", "C"

Average work fulfills and clearly demonstrates the stated objectives of the course syllabi and project statements. I expect everyone entering this studio is capable of this level of performance. These students demonstrate a low degree of professional dedication, lack self-confidence and require constant guidance on what to do next. If architecture is your life work then you must begin to author your own investigations today and direct the process of your work. This personal authorship usually manifests itself through additional and related contributions to the investigations of your project. The average student's resultant work demonstrates an understanding of the problem while acknowledging some deficiencies in self-confidence, basic design or communication skills, time management, or the lack of breath and depth of their daily investigations.

"D"

While complete, deficient work does not demonstrate how the stated objectives of the course syllabi and project statements have been fulfilled. These students generally suffer from one of the following deficiencies: lack of professional dedication, lack self-confidence, a close-minded attitude, lack of time management skills, lack of basic professional design and communication skills or outside personal problems. The deficient student's resultant work is often fragmentary, un-synthesized, incomplete, and seen only as an assigned "product" due on a particular day. As in any professional office, deficient work is not acceptable and will result in you having to retake the studio next year.

STATEMENTS

Subject to Change

With the exception of the grade and attendance policies, parts of this syllabus are subject to change with advance notice, as deemed appropriate by the instructor.

Students With Diabilities

To request academic accommodations due to a disability, please contact the ASU Disability Resource Center (http://www.asu.edu/studentaffairs/ed/drc/# ; Phone: (480) 965-1234; TDD: (480) 965-9000). This is a very important step as accommodations may be difficult to make retroactively. If you have a letter from their office indicating that you have a disability which requires academic accommodations, in order to assure that you receive your accommodations in a timely manner, please present this documentation to me no later than the end of the first week of the semester so that your needs can be addressed effectively.

Academic Dishonesty

All necessary and appropriate sanctions will be issued to all parties involved with plagiarizing any and all course work. Plagiarism and any other form of academic dishonesty that is in violation with the Student Code of Conduct will not be tolerated. For more information, please see the ASU Student Academic Integrity Policy: http://www.asu.edu/studentaffairs/studentlife/judicial/academic_integrity.htm

Intellectual Property

SALA has the right to retain any student project whether it be for display, accreditation, archive, documentation or any other educational or legal purpose. In addition, the College reserves the right to reproduce and publish images of any such student work in collegiate publications, printed or electronic, for the purposes of research, scholarship, teaching, publicity and outreach, giving publication credit to the creator/student.

SCHEDULE (tentative and subject to change)

Week	1	ACTIVITY	PROJECTS
THUR	1.21	1ST HALF - Lecture: Seminar Intro	
		2ND HALF - Tutorial / Lab session	
Week	2		
THUR	1.28	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	
Week	3		
THUR	2.4	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	
Week	4		
THUR	2.11	1ST HALF - Review Project 1	
		2ND HALF - Review Project 1	
Week	5		
THUR	2.18	1ST HALF - Lecture: Biomimetic Design	
		2ND HALF - Reading Discussion	
Week	6		
THUR	2.25	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	
Week	7		
THUR	3.4	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	
Week	8		
THUR	3.11	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	

SCHEDULE (tentative and subject to change)

Week	9	ACTIVITY	PROJECTS
THUR	3.18	SPRING BREAK - NO CLASS	
Week	10		
THUR	3.25	1ST HALF - Review Project 2	
		2ND HALF - Review Project 2	
Week	11		
THUR	4.1	1ST HALF - Lecture: Algorithmic Design	
		2ND HALF - Reading Discussion	
Week	12		
THUR	4.8	1ST HALF - Reading Discussion	Project 3
		2ND HALF - Tutorial / Lab session	
Week	13		
THUR	4.15	1ST HALF - Lecture: Materializing Information	
		2ND HALF - Review Project 3	
Week	14		
THUR	4.22	1ST HALF - Reading Discussion	
		2ND HALF - Tutorial / Lab session	
Week	15		
THUR	4.29	1ST HALF - Reading Discussion	Project 4
		2ND HALF - Tutorial / Lab session	
Week	16		
THUR	5.6	FINAL CLASS- Review: Project 4	
MON	5.10	ILLUSTRATOR PORTFOLIO ON CD DUE BY 5PM IN MY MAILBOX LOCATED IN THE COLLEGE OF DESIGN NORTH BUILDING	
		BLOG DOCUMENTATION DUE BY 5PM	

Working Bibliography:

ON PARAMETRIC AND ALGORITHMIC DESIGN:

Aranda, Benjamin & Lasch, Chris. Tooling. NY: Princeton Architectural Press, 2006. Selected pages.

Bentley, Peter J. & Kumar, Sanjeev. On Growth, Form, and Computers. San Diego: Elsevier Academic Press, 2003. Selected pages

Lynn, Gregg. Animate Form. Princeton: Princeton Architectural P, 1999. 1-44.

Pasquarelli, Gregg.“ Versioning”. AD Magazine Jan/Feb 2003.

Terzidis, Kostas. Algorithmic Architecture. Oxford: Elsevier, 2006. Selected Pages.

ON SYSTEMS THEORY:

Johnson, Steven. Emergence: The Connected Lives of Ants, Brains, Cities, and Software. NY: Scribner, 2002. Selected pages.

ON SYSTEMS THEORY AND DESIGN:

Allen, Stan. “From Object to Field.” Points and Lines. Princeton: Princeton Architectural Press, 1999. 24-31

Hensel, Michael, Achim Menges. “Morpho Ecologies”. Morpho-Ecologies. London: Architectural Association, 2006. 15-59.

Hensel, Michael.“ Material + Digital Design Synthesis”. AD Magazine March/April 2006. 88-97.

ON DIGITAL FABRICATION:

Iwamoto, Lisa. Digital Fabrications: Architectural and Material Techniques. New York: Princeton Architectural Press, 2009.

Kieran, Stephen and Timberlake, James. Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction. New York: McGraw-Hill 2004.

Klinger, Kevin and Kolarevic, Branko. Manufacturing Material Effects: Rethinking Design and Making in Architecture. New York: Routledge, 2008.

Kolarevic, Branko. Architecture in the Digital Age: Design and Manufacturing. London: Taylor & Francis, 2005.

ON RHINO:

Chenge, Ron. Inside Rhinoceros 4. NY: Onword Press, 2007.

Useful Websites:

Class website:

http://digitalecology.wordpress.com/
password: digital_eco_student

Rhino general topic websites:

http://en.wiki.mcneel.com/

http://en.wiki.mcneel.com/default.aspx/McNeel/RhinoHomeLabs.html

http://toi.bk.tudelft.nl/toi-pedia/index.php?title=Rhino

http://www.rhino3dhelp.com/video/

Rhino scripting websites:

http://rhinoscriptingresources.blogspot.com/

Rhino parametric modleling websites:

http://blog.rhino3d.com/2008/06/jarek-on-rhinoscript-grasshopper-and.html

http://grasshopper.rhino3d.com/2008/06/some-examples-of-grasshopper.html

CAD/CAM websites

http://www.ennex.com/%7Efabbers/

http://rapidprototyping101.com/