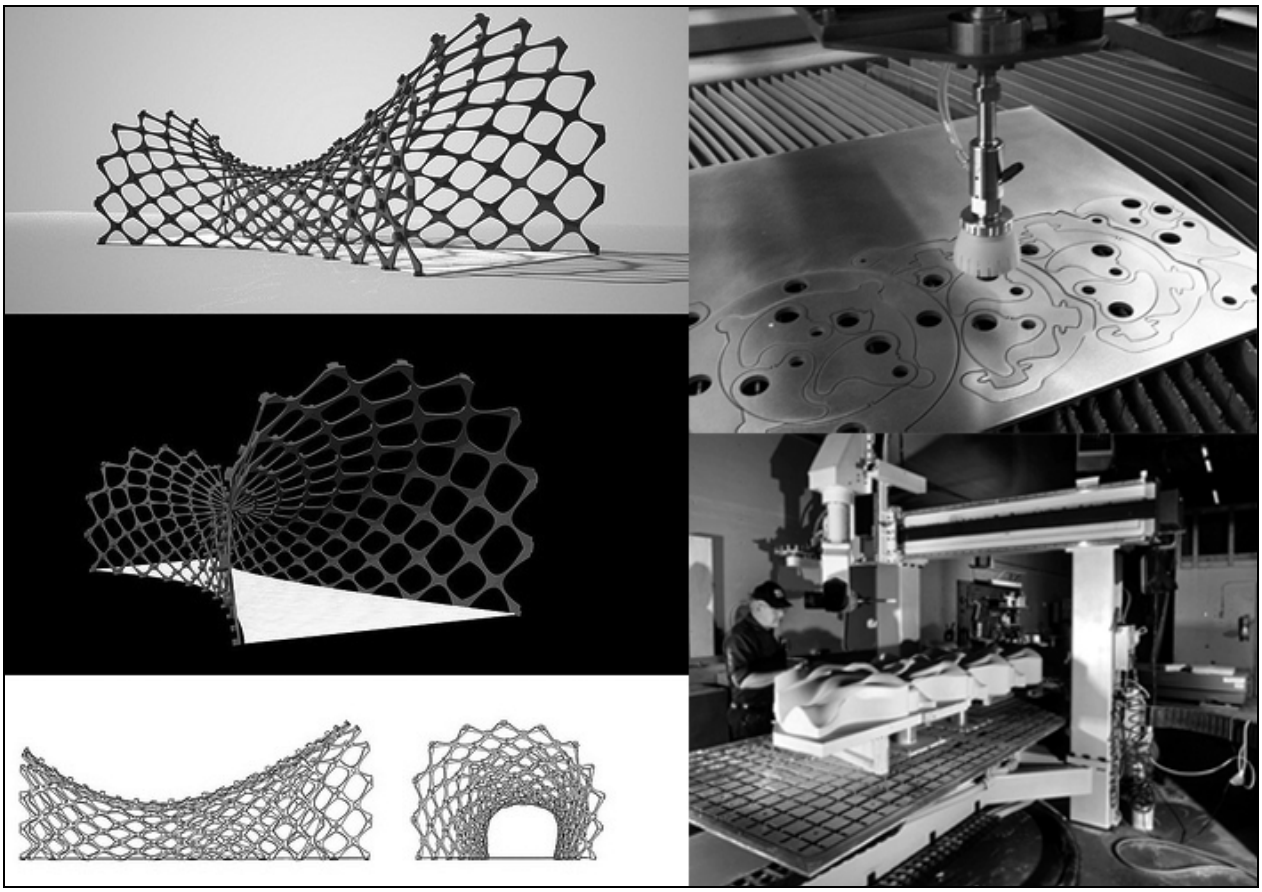
University of Texas Arlington
School of Architecture
ARCH 4343/5343-004
DIGITAL FABRICATION I
Room 324, Architecture Building

Assistant Professor Brad Bell
bbell@uta.edu
FALL Term 2012
MWF 11:00-11:50
Office Hours W 1:00-1:50



COURE OVERVIEW:
The use of digital technology in the architectural design process has evolved from a role as a mere representational device to that of a tool for instrumentalized simulation and fabrication. The desire to make buildings look like a rendering or to produce photo-realistic images and walkthroughs has given way to an opening of the potentials of the software to assist the designer with managing complex geometries, parametric organizational diagrams, structural analysis and integrated building systems.

Simulation has become the means by which virtual space becomes more than just a mirror of reality. It becomes the space within which different potential realities can be tested and evaluated before they are materially implemented. In architecture, information from material constraints to site conditions can be constantly entered into the computer models to provide an accurate update, which in turn introduces feedback into the overall design and change can be registered in the detail. Therefore simulation becomes a way of assessing the unfolding performance of the project and limits of a spatial system through a direct engagement with the underlying geometry of the design. In this regard virtual space becomes fluid and dialogical within the design process. There is no longer a reliance upon incremental scalar increase in order to arrive at greater degrees of fabrication accuracy, but rather a more dynamic and non-linear “cause and effect” methodology is now possible. It is through this lens that several different methodologies for developing a *computational fabrication tectonic* will be presented and explored through this seminar.

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COURSE STRUCTURE:

The Seminar will be comprised of 3 segments: *01_lecture, 02_demonstration, 03_application*. Student performance for the course will be evaluated for each segment to provide a cumulative grade for the seminar.

01_lecture Two categories of lectures will be presented throughout the semester. The first series of lectures will focus on the history, theory, and work of digital design applied to the field of architecture. The second series will focus on the current developments in CAD/CAM technology. All lectures will be given concurrent to assigned readings and will involve a discussion of the text and material presented. For an overview of lecture topics please refer to the course schedule.

02_lab A series of digital application and fabrication demonstrations will take place during the semester focusing on geometric manipulation and production techniques. The goal of these demonstrations is not complete application proficiency, but rather will introduce a way of thinking and constructing through digitally generated geometry. Several in-class assignments will be conducted during these demonstrations to ensure the students comprehension of the material.

03_application The cumulative focus of the seminar will be the *digitally fabricated system*. The project will use both the digital ways of thinking and constructing from the other two segments of the course and will use the CAD/CAM techniques to fabricate the project. The projects will be presented at a final review at the end of the semester.

STUDENT LEARNING OBJECTIVES

The Learning objectives will be evaluated through the 4 elements of the Course Structure as listed above. A summary of those objectives is as follows:

- General introduction to the theoretical underpinnings of current CAD/CAM technology.
- Historical reference for the factors contributing to the use of CAD/CAM technology.
- Role of CAD/CAM technology in the present architecture profession.
- Relevance of CAD/CAM to associated design professions.
- Preliminary introduction to complex geometric modeling techniques.
- General introduction to the techniques of 2D and 3D CAM fabrication.
- Translation of complex 3D geometric modeling to 2D fabrication templates.
- Hands-on introduction to the use of the laser cutter.

GRADE EVALUATION:

Class Participation	5%	Attendance, in-class discussion, documentation
Assignment 1:	15%	2D - Techniques
Assignment 2:	15%	3D – Techniques
Test	10%	Over Reading Assignments
Preliminary Review	15%	Final Design Project review
Final Review	40%	Final Design Project completed

ATTENDANCE POLICY

Standard University Attendance Policy will be enforced. For a detailed description of this policy please consult the Student Handbook.

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DROP POLICY

Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/ses/fao).

AMERICANS WITH DISABILITIES ACT

The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

ACADEMIC INTEGRITY

At UT Arlington, academic dishonesty is completely unacceptable and will not be tolerated in any form, including (but not limited to) “cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts” (UT System Regents’ Rule 50101, §2.2). Suspected violations of academic integrity standards will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University.

STUDEND SUPPORT SERVICES

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may contact the Maverick Resource Hotline by calling 817-272-6107, sending a message to resources@uta.edu, or visiting www.uta.edu/resources.

ELECTRONIC COMMUNICATION

UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

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STUDENT FEEDBACK SURVEY

At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.

FINAL REVIEW WEEK

A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

COURSE SCHEDULE:

week_1	08.23.11		week_9	10.15.11	Assignment 2: 3D Print
	08.25.11			10.17.11	Assignment 2: 3D Print
	08.24.11	Course Introduction & *READING # 1*		10.19.11	Assignment 2: 3D Print
week_2	08.27.11	*Lecture 1: Digital Thinking + Digital Making*	week_10	10.22.11	**Field Trip I**
	08.29.11	*Lecture 2: Digital Morphogenisis*		10.24.11	Assignment 3: Cast System
	09.31.11	*READING # 2*		10.26.11	Desk Crit
week_3	09.03.11	***Labor Day Holiday***	week_11	10.29.11	Desk Crit
	09.05.11	*Lectur 3: NURBS & Topological Architecture*		11.31.11	Desk Crit
	09.07.11	*Lecture 4: Intro to Digital Fabrication*		11.02.11	Desk Crit
week_4	09.10.11	*Lecture 5: Reverse Engineering + 2D cutting*	week_12	11.05.11	**Progress Review**
	09.12.11	*Lecture 6: Additive/Subtractive Logics*		11.07.11	Desk Crit
	09.14.11	DIGITAL LAB 1: Rhino		11.09.11	Desk Crit
week_5	09.17.11	DIGITAL LAB 2: Rhino	week_13	11.12.11	Production
	09.19.11	DIGITAL LAB 3: Rhino		11.14.11	Production
	09.21.11	DIGITAL LAB 4: Rhino		11.16.11	Production
week_6	09.24.11	DIGITAL LAB 5: Rhino	week_14	11.19.11	Production
	09.26.11	FABRICATION LAB 1: Laser Cutter		11.21.11	
	09.28.11	FABRICATION LAB 2: Laser Cutter		11.24.11	**Thanksgiving Holiday**
week_7	10.01.11	Assignment 1: Cut File	week_15	11.26.11	Production
	10.03.11	Assignment 1: Cut File		11.28.11	Production
	10.05.11	Assignment 1: Cut File		11.30.11	Production
week_8	10.08.11	DIGITAL LAB 3: 3D Printer	week_16	12.03.11	Production
	10.10.11	DIGITAL LAB 4: 3D Printer		12.05.11	**Final Review**
	10.12.11	Assignment 2: 3D Print		12.07.11	

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RECOMMENDED TEXTBOOKS

The New Mathematics of Architecture. By Jane Burry and Mark Burry. Thames & Hudson New York, NY. 2010.

Fabricating Architecture: Selected readings in Digital Design and Manufacturing. Edited by Robert Corser, Princeton Architectural Press, New York, NY. 2009

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

From Control to Design: Parametric/Algorithmic Architecture. Edited by Tomoko Sakamoto & Albert Ferré. VERB/Actar, Barcelona Spain, 2008.

Digital Design and Manufacturing: CAD/CAM Applications in Architecture and Design.
By Daniel Shodek,, Martin Bechthold, Kimo Griggs, Kenneth Martin Kao, Marco Steinberg.

Architecture in the Digital Age: Design and Manufacturing.
By Kolarevic, Branko. Spon Press, New York, NY. 2004.

BIBLIOGRAPHY:

Beasley, Phillip, Alice Cheng and Sean Williamson. ***Fabrication: Examining the Digital Practice of Architecture.*** Proceedings of the 2004 AIA/ACADIA Fabrication Conference. University of Waterloo, 2004.

Callicott, Nick. ***Computer-Aided Manufacture in Architecture: The Pursuit of Novelty.*** Architectural Press, Jordan Hill, Oxford, 2001

Hensel, Michael, Achiim Menges, Michael Weinstock eds. ***Emergence : Morphogenetic Design Strategies (Architectural Design).*** Academy Press, London, 2004.

Kolarevic, Branko. ***Architecture in the Digital Age: Design and Manufacturing.*** Spon Press, New York, NY. 2004.

Kolarevic, Branko, Ali M. Malkawi eds. ***Performative Architecture: Beyond Instrumentality***. Spon Press, New York, NY. 2004.

Leach, Neil, David Turnbull and Chris Williams. ***Digital Tectonics.*** Academy Press, London, 2004.

Leach, Neil ed. ***Designing for a Digital World.*** Academy Press, London, 2002.

Mori, Toshiko. ***Immaterial/Ultramaterial: Architecture, Design, and Materials.***

Pasquerili, Gregg + ShoP eds.***Versioning : Evolutionary Techniques in Architecture (Architectural Design).*** by SHOP editor, Academy Press, 2002.

Rahim, Ali ed.**Contemporary Techniques in Architecture (Architectural Design)** Academy Press, London, 2002

Rahim, Ali ed. **Contemporary Processes in Architecture.** Academy Press, London 1st edition, 2000.

Schafer, Ashley & Amanda Reeser, ***Praxis 6: New Technologies://New Architectures***, Issue 6, New Orleans, Garrity Press 2004.

Sheil, Robert ed. ***Design Through Making (Architectural Design).*** Academy Press, London, 2005

Shodek, Daniel, Martin Bechthold, Kimo Griggs, Kenneth Martin Kao, Marco Steinberg. ***Digital Design and Manufacturing: CAD/CAM Applications in Architecture and Design.***

Terzidis, Kostas, ***Expressive Form: A Conceptual Approach to Computational Design.*** Spon Press, New York, NY. 2003.

Thompson, D'Arcy, ***On Growth and Form.*** Dover Publications, Revised edition1992, first edition 1917.