

COMPUTATIONAL DESIGN

Instructor: Kory Bieg
Associate Professor, The University of Texas at Austin
Email: kory@otaplus.com
Office | Goldsmith, Room 4.136
Office Hours | By Appointment

Wed | 9:00am - 12:00pm | WMB 5.112

Canvas Class Website: <http://canvas.utexas.edu/>

"An architect operating under essentialism would extract from a natural system such as a honeycomb all that is invariant, an essential hexagonal cell, seeing all that departs from it in the model as error or accident. We recognize those preserved errors as inherently systematic as any pure geometry, the result of influences from the context or from within the system itself." Resier + Umemoto, *Atlas of Novel Tectonics*

"Beautiful is an adjective that we often employ to indicate something that we like. What is beautiful is the same as what is good, and in fact in various historical periods there was a close link between the Beautiful and the Good...A beautiful thing is something that would make us happy if it were ours, but remains beautiful even if it belongs to someone else." Umberto Eco, *History of Beauty*



COURSE DESCRIPTION

Design processes are rapidly evolving as new programs are co-opted from other industries and technological advancements change the way we build. This class will look at the experimental application of digital tools to develop new tactics for design. Students will develop a series of digital models using an evolutionary design approach, rapidly producing a large number of iterations. Select models will be embedded with procedurally driven surface systems and further modified using texture mapping techniques. Finally, students will create a short animated film for their final project.

The class is divided into 4 project-based assignments. Each assignment builds on the completion of the previous one through an integrative design process. Each student will develop one object (defined loosely) over the course of the semester that will be continually modified, updated, and calibrated through constant feedback and exchange. Students will develop a project agenda with specific goals informed by an analysis of the object itself. The qualities that emerge through the design process will provide a framework for the further development of the project and a tool for evaluation. The agenda

will not be one of optimization. Rather, students will develop a multi-layered and multi-functional object with cross-scalar properties made manifest in the object's form, performance, and physical properties — or put simply, its digital matter.

Though the goal is not to produce buildings (program, circulation, site), projects will be evaluated on their spatial and experiential potential and attention to digital craft. Students will be using Autodesk 3ds Max for the generation and visualization of form and Processing for pattern, texture, and surface design.

The seminar will be taught through a series of in-class tutorials, discussions, readings, and project based critiques. Students will attempt to reconnect highly specialized trajectories of architectural discourse into a single, cohesive design process.



ATTENDANCE

Class meets on Wed from 9:00am-12:00pm in West Mall Building, 5.112

Attendance is mandatory. Two (2) unexcused absences will result in a full letter grade drop in your final grade for the course. Three (3) unexcused absences may result in administrative failure and being dropped from the course. Absences are only excused with written documentation of a medical condition or family emergency. If you plan on missing class for the observance of a religious holy day, please notify the instructor at least 14 days prior per UT Austin policy. It is up to the student to complete work missed due to excused absences within a reasonable time frame. If you show up late (5 minutes after the start of class) 3 times, it will be counted as 1 unexcused absence.



GRADING POLICY

Grading for the course is based on the full completion of all assignments. The percentage breakdown listed below is only for reference. Please be aware that the final project is a synthesis of all the assignments. If you do not complete or perform unsatisfactorily for any of the assignments, your grade for future assignments will most likely be negatively impacted.

Attendance, Participation, and Presentation	20%
ASSIGNMENT 01 Evolutionary Form Catalog	25%
ASSIGNMENT 02 Procedural Membrane	25%
ASSIGNMENT 03 Animation	20%
ASSIGNMENT 04 Final Submittal, project text	10%

A(-) Excellent

Project surpasses expectations in terms of inventiveness, appropriateness, visual language, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class. Project is complete on all levels.

B(+,-) Above Average

Project is thorough, well presented, 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 and not pursued with dedication and rigor. Project is incomplete in one or more areas.

D(+) Poor

Project is incomplete. Basic grasp of skill is lacking, visual clarity or logic of presentation are not level-appropriate. Student does not demonstrate the required competence and knowledge base.

F Fail

Project is unresolved. Minimum objectives are not met. Performance is not acceptable. Note that this grade will be assigned when you have excessive unexcused absences.

X Excused Incomplete

Can be given only for legitimate reasons of illness or family emergency. Simply not completing work on time is not an adequate cause for assigning this evaluation. It may only be used after consultation with the Associate Deans' offices and with an agreement as to a new completion date. Work must be completed before the second week of the next semester in which you are enrolling, according to the School of Architecture policy.



DISABILITIES

Please notify your instructor of any adaptation you may require to accommodate a specific physical need. You will be requested to provide documentation to the Dean of Student's Office, in order that the most appropriate accommodations can be determined. Specialized services are available on campus through the Services for Students with Disabilities, also found via the web at: <http://www.utexas.edu/diversity/ddce/ssd/> or by phone at 512.471.6259



CARE PROGRAM

Counselors in Academic Residence (CARE) Program places licensed mental health professionals within the colleges or schools they serve in order to provide better access to mental health support for students who are struggling emotionally and/or academically.

Abby Simpson is the CARE counselor for the School of Architecture. Faculty and staff may refer students to the CARE counselor or students may directly reach out to her.

Abby Simpson | BTL 114B | (512) 471-3115

https://cmhc.utexas.edu/CARE_simpson.html



HONOR CODE

It is expected of every student to abide by the UT Honor Code. Dishonesty and/or the poor treatment of your classmates will not be tolerated. The UT Honor Code (or statement of ethics) and an explanation or example of what constitutes plagiarism can be found at: <http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html>



SAFETY AND SECURITY

Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside. Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building. Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class. In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office. To find more information regarding emergency evacuation routes and emergency procedures go to: www.utexas.edu/emergency



COURSE REQUIREMENTS

There are no pre-requisites for the course, though a knowledge of 3d modeling is recommended.

Students are required to have a laptop computer that is capable of running high performance 3d software applications, including Autodesk 3ds Max and Processing. All programs should be 2017 versions or later. Students will also be required to purchase and install VRAY, a rendering plug-in for 3ds Max.

Weekly progress and participation in class pin-ups and reviews is required, including completion of assigned readings and participation in discussions. Each week, 1 or more students will be required to present a review of the weeks required readings and the work/theory of the author.

The submission of high quality final renders (jpeg format), your final 3ds Max and Processing files, a 350 word project description, and your final animation on a USB Flash Drive or via a downloadable link is mandatory. Failure to submit your work by the final day of class will result in a minimum full letter grade drop in your final grade for the course.

Students will use multiple software programs, capitalizing on each program's best features in order to unlock potential new territories of form-making and methods of design. Though each program is independently parametric, students will also work parametrically across platforms. The use of multiple software packages will help the students overcome limitations imposed by current BIM programs, while promoting a new integrated digital approach to the design of form, surface, and ornament.

Install all required software by the start of the second class.

Required Software Includes:

- Autodesk 3ds Max 2018 or later, 64-bit | free student version
- Processing 3D | free download
- VRay 2.0 or later, 64-bit for 3ds Max

Additional Software:

- Adobe Photoshop CS6 or later
- Adobe Illustrator CS6 or later
- Adobe After Effects CS6 or later



COURSE SCHEDULE

WK 1	W. 1/23		Introduction to Class / Review Syllabus / Assign Readings
		Tutorial	3ds Max, Processing, VRAY General Overview
		Assignment	Install All Required Software
WK2	W. 1/30	Assignment	Assignment 01 Evolutionary Form Catalog
		Tutorial	3ds Max
		Reading DUE	Steven Johnson, Emergence Philip Ball, The Self-Made Tapestry Casey Reas, Form and Code (Supplemental)
WK3	W. 2/6	PIN-UP / Due Assignment	Assignment 01a Evolutionary Form Catalog Assignment 01b Evolutionary Form Catalog (Variations)
		Reading DUE	Greg Lynn, Architectural Curvilinearity Gilles Deleuze, The Fold – Leibniz and the Baroque Greg Lynn, Animate Form (Supplemental)
WK4	W. 2/13	Desk Crits	
		Reading DUE	Mario Carpo, The Digital: From Complexity to Simplicity and Back Resier + Umemoto, Atlas of Novel Tectonics Mario Carpo, Ten Years of Folding (Supplemental)
WK5	W. 2/20	PIN-UP / Due Assignment	Assignment 01b Evolutionary Form Catalog (Variations) Assignment 02 Procedural Membrane
		Tutorial	Processing
		Reading DUE	Ali Rahim, Interiorities Lars Spuybroek, The Radical Picturesque Ali Rahim, Uniformity and Variability (Supplemental)

WK6	W. 2/27	Tutorial	Processing
		Reading DUE	Mark Foster Gage, Software Monocultures Tom Wiscombe, Project Mark Foster Gage, In Defense of Design (Supplemental) Tom Wiscombe, Extreme Integration (Supplemental) Tom Wiscombe, Emergent Processes (Supplemental)
WK7	W. 3/6	Tutorial	Processing
		Reading DUE	David Ruy, Returning to (Strange) Objects Neri Oxman, Per Formative David Ruy, Lessons from Molecular Gastronomy (Supplemental)
WK8	W. 3/13	Desk Crits	
		Reading DUE	Manuel De Landa, Deleuze, Diagrams, and the Genesis of From Sanford Kwinter, Architectures of Time Manuel De Landa, Matter Matters (Supplemental) Manuel De Landa, Nonorganic Life (Supplemental)
NO CLASS /// SPRING BREAK 3/20			
WK10	W. 3/27	PIN-UP	Assignment 02 Procedural Membrane
		Reading DUE	Graham Harman, Aestheticizing the Literal Patrik Schumacher, Parametric Patterns Patrik Schumacher, A Critique of Object Oriented Architecture (Supplemental) Graham Harman, Response to Schumacher (Supplemental) Patrik Schumacher, Tectonic Articulation (Supplemental)
WK11	W. 4/3	PIN-UP / Due Assignment	Assignment 02 Procedural Membrane Assignment 03 Animation
		Tutorial	Autodesk 3ds Max After Effects
		Reading DUE	Achim Menges and Michael Hensel, Versatility and Vicissitude Jane Burry, The Construction of a Problem Achim Menges and Michael Hensel, Patterns in Performance-Oriented Design (Supplemental) Jane and Mark Burry, Gaudi and CAD (Supplemental)

WK12	W. 4/10	Tutorial	Autodesk 3ds Max After Effects
		Reading DUE	Roland Snooks, Behavioral Formation Gilles Retsin, Discrete and Digital Daniel Kohler and Rasa Navasaityte, Mereological Tectonics (Supplemental)
WK13	W. 4/17	Desk Crits Assignment	Assignment 04 Final Submittal, project text
WK14	W. 4/24	Desk-crits	
WK15	W. 5/1	DUE	Assignment 03 Animation Assignment 04 Final Submittal, project text
WK16		FINAL EXHIBITION OF ANIMATIONS	



WEB RESOURCES

<https://www.autodesk.com/education/free-software/featured> (Autodesk Student Download)

<https://processing.org/> (Processing Download)

<https://store.chaosgroup.com/products/educational> (VRay Educational Version)

<https://www.vray-materials.de/> (Free VRay Materials)

<https://www.lynda.com/> (Tutorials, free with UTexas login)

<https://www.youtube.com/user/korybieg> (tutorials, all programs, by me!)

<https://www.plethora-project.com/education/> (tutorials)

https://www.youtube.com/channel/UCvjgXvBlbQiydffZU7m1_aw (Processing tutorials)