COVID HEADER

This course is provided in a fully online delivery format. Students will need to have access to a webcam and microphone for remote delivery of the class.

Course Number and Catalog Title

ARCH 3341 Digital Media II

College of Architecture, Texas Tech University

Semester and Year

Fall 2020

Instructor(s)

Stephen Mueller, Research Assistant Professor
Course Coordinator | s.mueller@ttu.edu | 806.834.5257 | Office Hours Online By Appointment

Andres Gandara, Instructor | | Office Hours By Appointment

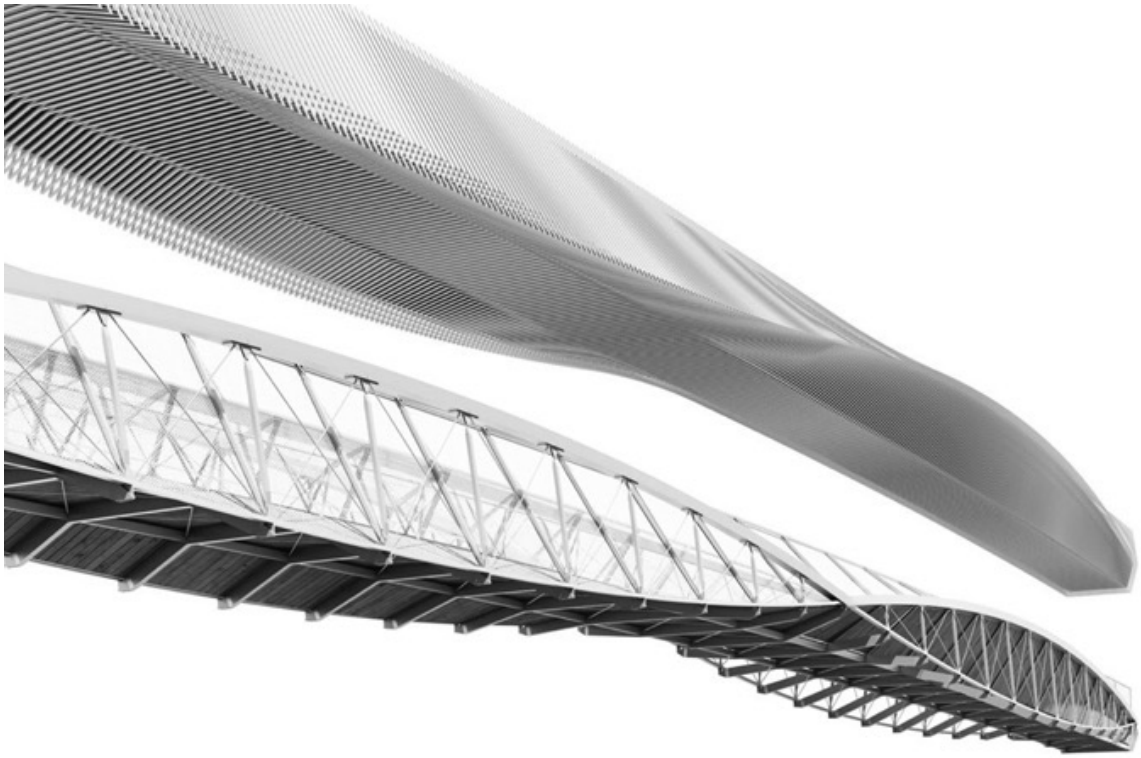

Image Credit: SHoP Architects | West Thames Street Bridge, London

COURSE TITLE

Digital Media II : Crafting Complexity

CATALOG DESCRIPTION

3341. Digital Media II (3). Prerequisite: ARCH 1353 and ARCH 1202. The use of 3-D computer graphics and modeling or design development with an emphasis on multimedia design presentations. Fall. Credits: 3 semester credit hours.

COURSE DESCRIPTION

The course will introduce students to paradigmatic and emerging *models* of contemporary digital production, accelerating capacities for design exploration, execution, and communication. The digital technologies architects use to generate, measure, assess, refine, and represent designs have the ability to shape new possibilities for our built environment and our lived experience. A foundational fluency and critical engagement with emerging design technologies—including computational, generative, and analytical tools—can provide real-time feedback between input and output, desire and effect.

This course will introduce students to a range of digital design software environments and techniques, with an emphasis on developing and representing *highly crafted* digital and physical *models,* alongside 2D and 3D digital drawings, with each artifact exhibiting a high degree of **digital craft** and **complexity**. Craft, in architectural representation, is tied intimately to the craft of construction itself. As architects craft representations—drawings and models of space—they imagine, test, speculate on, and anticipate possible constructed worlds. Architects must constantly navigate the gap between the *immaterial* virtual environment and the *material* constructed environment it implicates. A *digitally crafted representation* will exhibit both the mastery of digital skill *and* input from the material world it engages. Complexity in this course is understood as describing architectural and representational systems in which many parts are inter-related and codependent – each element affects and contributes to the whole.

The course is designed to work both as the supporting course associated with **ARCH 3601** and as a "stand alone" course. While some class time will be devoted to completion of assignments, it is expected that a student with a median skill and acumen level should require 9 hours of study per week outside of class time to successfully complete the coursework.

PROJECT OVERVIEW

The course is structured in a related series of projects supported by tutorials in software applications, drawing types, and rapid prototyping techniques. The projects build on each other, to create a depth of investigation and an individual portfolio of work, consisting of drawings, constructed artifacts, and model photos. Projects highlight particular drawing types (elevation, section, axon, and section perspective) and their potential uses for architectural design and communication. Students will work iteratively between digital input and real-world output to refine their approach.

Project 1—Crafting Complex Drawings (4 weeks)

Students will learn to craft complex architectural geometry and complex architectural drawings using Rhino.

Project 2—Crafting Complex Models (4 weeks)

Students will learn to craft complex physical models using the lasercutter, capture high quality model photos, and edit photos using advanced non-destructive editing techniques in Photoshop.

Project 3—Crafting Complex Imagery (3 weeks)

Students will learn to craft complex renderings in Rhino, composite imagery in Illustrator, and layouts in InDesign.

Project 4—Crafting Complex Geometry (3 weeks)

Students will learn to craft their own complex, parametrically-driven models using Grasshopper and related plug-ins.

STUDENT LEARNING OBJECTIVES

Disciplinary Objectives:

- Develop understanding of explicit, relational, and parametric modeling paradigms
- Develop fluency in iterating between digital and analog methods of representation
- Develop critical understanding of digital tools and workflows

STUDENT PERFORMANCE OBJECTIVES

Professional Objectives:

- Learn intermediate / advanced digital modeling techniques
- Learn rapid prototyping / model fabrication techniques
- Develop high level of craft in digital drawing and modelmaking

On completion of this course the student should:

- Be able to correctly draw planar and sectional constructs;
- Be able to describe common 2D & 3D digital modeling conditions and their impact on architectural design and fabrication techniques;
- Be able to convey drawings and diagrams through clear but advanced graphical techniques and methods;
- Be able to manipulate and coordinate complex and detailed digital models of building systems through parametric modeling software
- Be efficient and creative with file management, digital model management, sheet layout, portfolio layout and portfolio design

MEANS OF EVALUATION

Deliverables

Students are responsible for submitting **daily progress submissions,** final **project submissions** at the end of each project, and a **final digital submission** of their entire semester's work. Deliverables include digital drawings, model photos, and layouts listed below:

PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
Daily Progress: 1.1 Precedent Section 1.2 Constructed Curves 1.3 Constructed Surface 1.4 Relational Substructure 1.5 Exploded/Assembled Axon 1.6 Third Angle Projections 1.7 Section 1.8 Plans 1.9 Composite Drawings 1.10 Section Perspective Drawings	Daily Progress: 2.1 Contour Model 2.2 Rib Model 2.3 Faceted Model 2.4 Model Photos 2.5 Edited Model Photos	Daily Progress: 3.1 Rendered Views 1 3.2 Rendered Views 2 3.3 Rendered Views 3 3.4 Camera Matching 3.5 Illustrator Compositing 3.6 InDesign Layout	Daily Progress: 4.1 Custom Geometry 4.2 Primary and Secondary Structure 4.3 Parametric Section 4.4 Parametric Variations 4.5 Parametric Representations 4.6 Parametric Volume
Project Grade: P1 Project Submission	Project Grade: P2 Project Submission	Project Grade: P3 Project Submission	Project Grade: P4 Project Submission
Students are additionally responsible to submit a final Digital Submission including their entire semester's work.			

Assessment

Project 1 Submission = 22.5%

Project 2 Submission = 22.5%

Project 3 Submission = 17.5%

Project 4 Submission = 17.5%

Daily Quizzes = 10% (5% by mid-term)

Daily Progress = 10% (5% by mid-term)

Project submissions will be assessed from the digital files submitted as the final project submission will be the primary evidence of student performance. Requirements for the assignments are outlined in written descriptions and communicated through in-class or online instruction – please be sure to read all written requirements carefully, and take note of additional expectations covered in class or in class videos. The ability of the student to integrate and apply knowledge gained through tutorials, class instruction, and instructor feedback will be assessed. Each project will be graded based on the following criteria:

Craft	40%	Did the student demonstrate care, rigor, and precision in the construction of the digital model, drawing, prototype, video, and/or presentation? Are drawings clear and legible without errors or omissions? Are lineweights refined for printing? Are models and printed material carefully assembled? Are photographs carefully lit, composed, cropped, and edited? Are videos edited for clarity and at the correct resolution? Is the composition of the graphic presentation considered?
Completion	40%	Did the student complete all written requirements outlined in the assignment and other requirements communicated in class? Does the student demonstrate ability to apply knowledge gained through tutorials, class instruction, and instructor feedback in the completion of the work?
Originality	20%	Does the assignment demonstrate individual initiative, experimentation, risk, advanced techniques or original perspectives on the given assignment?

Daily quizzes will be posted to the course website, covering core concepts, commands, terminology, and/or workflows introduced in the video tutorials. You are expected to watch all scheduled video tutorials during the scheduled class time and complete the quiz by end of class. Your quiz score will be evaluated based on your timely completion and comprehension of material covered. Quizzes incomplete by end of day will receive 0% credit. If you are having difficulty accessing the course material please contact your instructor during class.

Daily progress submissions will be assessed through digital files submitted at each progress deadline to the course website.

Your instructor will ask for you to upload progress on assigned portions of projects, in advance of the final project deadline, to review your progress in the course and facilitate your completion of the project. Your timely submittal of these incremental deadlines is essential to your success in the course. Each class session is designed to build on the course material presented by the instructor in previous sessions *and* your continued, self-driven dedication to developing your projects outside of class. Completing project tasks by assigned due dates will ensure you are prepared for class each day, and that you have a chance to raise questions about your work in advance of the deadline.

Daily progress is evaluated in terms of completion only. Progress submissions that show full completion of the assigned tasks will be given full credit. Late progress submissions, received the same day of the submission deadline will be given 50% credit for work shown. Late progress submissions received the next day or later will be given 0% credit. If you are having any technical difficulties that prevent you from submitting on-time, please contact the instructor with evidence of the technical difficulty (screenshots of any errors), and images showing the portions of the assignment completed). In some circumstances, a late progress submission may be approved for full credit with proper documentation of adequate effort.

Final Digital Submission. All your final files should be turned in digitally at the end of the semester in the final submission format provided by the instructor. YOU WILL NOT RECEIVE A GRADE FOR THE COURSE UNTIL ALL OF YOUR WORK IS PROPERLY SUBMITTED.

TEACHING METHODS

Synchronous and Asynchronous Learning

This course will meet synchronously at the start of each scheduled class. Instructors will discuss daily and weekly objectives, answer questions, and/or assist students in assignments via videoconference during class as time permits. Course material, including video tutorials, will be available asynchronously via the Course Website.

Online Video Tutorials and Chat

Most classes you will be directed to watch video tutorials posted to the course website. Students are expected to remain on the videoconference call for the duration of the class, and are encouraged to use the chat feature to ask questions as they work through the video for instructors to answer. If class time remains, instructors may address questions at the end of class as well.

Prints And Prototypes

In this course students will develop digital models with the intention of crafting their final output—the **digital drawing** and the **constructed prototype**. Digitally crafted drawings and models require a high degree of dedication, precision, skill, and flexibility to produce. They also require consistent *feedback* between the digital modeling environment and its 'real-world' output. You will be asked to work *iteratively* on a select few drawings and models, crafting the relationship between the digital environment and the drawn or constructed *artifact*. Students will develop an ability to assess and refine digital drawings based on visual and material feedback from the digital print or prototype.

Software Overview

For all digital modeling and vector graphic output in this class, students will work exclusively in the **Rhino** and **Grasshopper** modeling environments, developing modeling and representational strategies to convey *complex* geometric, tectonic, and spatial relationships. Students are expected to develop layer management strategies, lineweight, linetype, and print settings **in Rhino**, in order to print directly from Rhino to final vector (PDF) format for all assignments.

A successful drawing will leverage the 3D model in order to produce a crafted 2D representation. As such, all drawings will need to be carefully constructed, edited, and assembled as flat linework in 2D Rhino layouts, with saved views, and using viewports at known scales. All adjustments to geometry, lineweight, and linetype must be done within the Rhino environment before export. There will be no 'post-production' editing of *linework* from Rhino allowed (in Illustrator or other software), encouraging quick output and efficient updating of high-quality printed drawings. A successful drawing will also require careful editing and iterative development. *Drawings printed directly from 3D views, or flattened 3D views without graphic adjustments for legibility and editing of errors will not be accepted.*

Students will develop image editing and file management 'best practices' which leverage the strengths and optimal uses of graphic editing and layout platforms, developing good file management habits which maintain original image quality.

Adobe Photoshop will be used exclusively for raster (pixel-based) image editing.

Adobe Illustrator will be used exclusively for compositing vector linework with raster images.

Adobe InDesign will be used exclusively for presentation layout and portfolio design.

Students will become familiar with exchanging files between different modeling and production software platforms.

The software and plug-ins presented in class are meant as an introduction to basic and intermediate techniques in similar software platforms, which can help students develop a fluency, curiosity, and praxis related to digital production techniques. Students are encouraged to explore other digital production techniques beyond the scope of in-class instruction.

Course Website on Blackboard:

We will use Blackboard (www.blackboard.ttu.edu) for official course communications and assignment submittals. Please check the course website on Blackboard regularly for announcements, updates, and new content.

Assignment Submittals on Blackboard *and* OneDrive:

You will be asked to submit daily assignments and/or project submittals on Blackboard and provide an archive copy of each major assignment and review in the appropriate folder in Microsoft OneDrive. Links for all submissions will be provided on Blackboard.

Zoom Classroom:

We will plan to use Zoom video conferencing as our virtual classroom for lectures, tutorials, individual and group discussions, desk crits, and/or reviews. Please join the class on Zoom at the start of each class session. Please turn on your video and mute your microphone unless you are speaking.

Some class periods, and/or portions of class periods may be reserved for individual work sessions. At the beginning or before each class, I will let you know if your attendance in the Zoom classroom is needed for the full session, if we will breakout into group or individual discussions, or if we will end the Zoom conference and reconvene at a later time.

A link to access the Zoom Classroom is also provided in Blackboard.

Zoom Classroom Attendance:

You are expected to attend each class via the virtual classroom, and to be available to share your work and engage in discussions during the full class time. For non-structured time or individual work sessions outside of the Virtual Classroom, you are expected to focus on your class work during the full class time.

If technical issues or other issues prevent you from joining, please email, call, or text me in advance and we can discuss whether attendance will be excused.

Mural

We will use Mural (app.mural.co) for sharing drawings and other work for desk crits and reviews. You may be expected to keep a digital journal of your full semester's work (including work in progress and iterations of developments) on one or more personal "murals" within the course "room," and upload to shared "murals" for group discussions, pinups, and/or reviews.

Mediasite Channel

Tutorial videos will be made available on the course Mediasite Channel. A link to the channel is provided on the course Blackboard site.

Students are expected to watch all videos and complete all tasks described.

COURSE SCHEDULE

This schedule constitutes a draft schedule for the course. Details subject to change at discretion of instructor. Any changes will be communicated promptly via Course Website.

PROJECT 1				
D		Module	Topic Overview	Daily Progress Due / Daily Progress Assigned / *Daily Quiz Due*
M	Aug 24	**Course Introduction**	**Introduction to Digital Craft**	
		Rhino Interface	Rhino Interface *Navigation, Zoom, Pan, Orbit, Viewports* *Mouse Commands, Toolbars, Command Line* *Selecting and Deselecting Objects* *Properties Panel*	
		Crafting a Digital Workspace	Installing and Using AutoCAD aliases Setting up Autosave in Rhino Installing Cloud Storage Services	Task: Install Rhino 6 Task: Install AutoCAD aliases Task: Set up Autosave in Rhino Task: Install Cloud Storage Service (Google Sync or Similar)
		Understanding Rhino Geometry	Understanding Rhino Geometry: Points, Lines, Surfaces *Point, Points, Line, PlanarSrf, ExtrudeCrv, ExtrudeSrf, Cap, DupEdge, Join, Explode, SelectionFilter* Working in 2D, 2.5D, 3D *Ortho, Osnap, Project, Gumball, Move, Rotate, Rotate3D, Scale* Understanding Scale and Units *Options, Units* Organizing Your Digital Model *Layers, Hide, Show, Isolate, Unisolate, Lock, Unlock*	
W	AUG 26	**Crafting a Precedent Drawing**	Working with Reference Images, Guide Geometry, and Scale *Picture, Guide, Scale* Using, Adjusting, and Creating Display Modes	1.1 Precedent Section *1.1 Daily Quiz Due*

			DisplayProperties, Wireframe, Shaded, Technical, Pen, SetObjectDisplayMode Saving Rhino Views as Files *ScreenCaptureToClipboard, ViewCaptureToFile*	
		Crafting Curves	**Understanding Rhino Geometry: NURBS Curves** Constructing Polylines and Bezier Curves *Polyline, Close, Fillet, HandleCurve, HBar* Constructing NURBS Curves *Curve, InterpCrv, Degree, Close, TweenCurves* Editing NURBS Curves PointsOn (POn), PointsOff (POff), *InsertControlPoint* Curve Properties *Curvature, CurvatureGraph, Parameter*	1.1 Due 1.2 Constructed Curves *1.2 Daily Quiz Due*
M	AUG 31	**Crafting Surfaces**	Surface Modeling from Curves *PlanarSrf, EdgeSrf, NetworkSrf, Revolve, Sweep1, Sweep2, Loft* Other Surface Modeling Commands *Srfpt, Join, Explode* Surface Properties (Normal Direction, UV Coordinates) *Dir, Flip, EvaluateUVPt* Extracting Surface Geometry *Section, Contour, ExtractIsocurve* Transforming 3D Geometry *SolidPtOn, Scale, Scale1D, Scale2D, CageEdit*	1.2 Due 1.3 Constructed Surface *1.3 Daily Quiz Due*
		Instance Geometry, Reference Geometry, Relational Geometry	**Understanding Relational Modeling** Orienting geometry *CPlane, Divide, Orient, Orient3D, OrientOnCrv* Instance Geometry *Block, BlockEdit* Reference Geometry *Worksession* Relational Geometry *RecordHistory*	1.3 Due 1.4 Relational Substructure *1.4 Daily Quiz Due*
		Crafting Views	Understanding Orthographic Views *Cplane, Plan, OrientCameraToSrf* Isometric Views *NamedView, Camera, ShowCamera*	1.4 Due 1.5 Exploded/Assembled Axon *1.5 Daily Quiz Due*

			Perspective Views *Zoom Lens (Field of View), Walkabout, Lookabout* Axonometric Views *NamedPosition*	
		Crafting Drawings	Using Make2D *Make2D, Hidden Lines, MeshOutline, Silhouette, Third Angle Projection* Sheets and Layout *Detail, Layout, PrintDisplay, Text, SetCurrentDimStyle, ScaleDimStyle* Lineweights, Linetypes, Linetype Scale Ground, Section Cut, Profile, Edge, Pattern *Options, Detail, Custom Line Patterns!* Refining the Model and the Drawing *Intersect, Trim, Extend, BringForward, BringToFront*	1.5 Due 1.6 Third Angle Projections *1.6 Daily Quiz Due*
W	Sep 2	**Crafting a Section Drawing**	Crafting a Section Drawing from a 3D Model *Section, Cutplane, Split, Trim* *ClippingPlane,* Lineweights: Ground, Section Cut, Profile, Edge, Pattern	1.6 Due 1.7 Section *1.7 Daily Quiz Due*
M	SEP 7	LABOR DAY – NO CLASS		
W	SEP 9	**Crafting Plan Drawing**	Crafting a Plan Drawing from a 3D Model *Section, Cutplane, Split, Trim* *ClippingPlane,* Lineweights: Ground, Plan Cut, Profile, Edge, Pattern Dashed lines above plan cut/thin lines below the plan cut	1.7 Due 1.8 Plans *1.8 Daily Quiz Due*
M	SEP 14	**Crafting Composite Drawings**	**Understanding Composite Drawings** Creating Reflection and Projection Lines Between an Axon, Plan and Section	1.8 Due 1.9 Composite Drawings *1.9 Daily Quiz Due*

M	SEP 12	**Section Perspective Drawing**	Section Perspective Drawings	1.9 Due 1.10 Section Perspective Drawings *1.10 Daily Quiz Due*
PROJECT 2				
M	SEP 21	**Intro to Grasshopper**	**Intro to Parametric Modeling in Grasshopper** GH-Interface: Nodes, Wires, Variables GH-Referencing Rhino Geometry *Point, Line, Curve, Surface, Brep, Geometry components*	**Project 1 Due**
		Preparing a Contour Model	GH-Preparing a Contour Model *Loft, Loft Options, Contour, Bake* GH-Introduction to Managing Lists *GH Script: Space Curves for Printing/Lasercutting(Construct Point, Series, Orient)* Preparing a File for Lasercutting Costs, queue, material types, cut depth and intensity Engraving Part Numbers	2.1 Contour Model *2.1 Daily Quiz Due*
W	SEP 23	**Work Session**		
M	SEP 28	**Rib Models**	Preparing a Rib Model	2.1 Due 2.2 Rib Model *2.2 Daily Quiz Due*
W	SEP 30	**Work Session**		
M	OCT 5	**Faceted Models**	Understanding Surface Types Developable Surfaces, Ruled Surfaces, Single and Double Curvature, *CurvatureAnalysis* Preparing a Faceted Model *UnrollSrf, MeshOutline, Squish, Smash* *GH Script: Add Tabs in Grasshopper*	2.2 Due 2.3 Faceted Model *2.3 Daily Quiz Due*
W	OCT 7	**Work Session**		

M	OCT 12	**Crafting Model Photos**	**Model Photography**	2.3 Due 2.4 Model Photos *2.4 Daily Quiz Due*
W	OCT 14	**Intro to Creative Cloud**	**Understanding Raster Images, Vector Images, and Layout Design** *Best Practices for using Photoshop, Illustrator, and InDesign*	
		Non-destructive photo-editing with Photoshop	Photoshop Image Editing Photoshop Masks Photoshop Adjustment Layers Photoshop Automated Commands	2.4 Due 2.5 Edited Model Photos *2.5 Daily Quiz Due*
PROJECT 3				
M	OCT 19	**Rendering in Rhino I**	Rendering Basics *RenderSettings, Render* Lighting and Shadow *DirectionalLight, PointLight, RectangularLight, Sun*	**Project 2 Due** 3.1 Rendered Views 1 *3.1 Daily Quiz Due*
W	OCT 21	**Rendering in Rhino II**	Materials *Materials* Material Mapping *MappingWidget*	3.1 Due 3.2 Rendered Views 2 *3.2 Daily Quiz Due*
M	OCT 26	**Rendering in Rhino III**	Environments and Effects *Environments* Rendering Channels in Rhino *Z-Depth, Alpha*	3.2 Due 3.3 Rendered Views 3 *3.3 Daily Quiz Due*
W	OCT 28	**Camera Matching in Rhino**	Camera Matching in Rhino *Wallpaper, Perspective Match*	3.3 Due 3.4 Camera Matching *3.4 Daily Quiz Due*
M	NOV 2	**Compositing in Illustrator**	Illustrator–Compositing with Clipping Masks *Illustrator Interface, Placing and Embedding Files* *Using the Pen Tool, Using Clipping Masks* *Layering, Select By Stroke Color/Fill Color/Stroke Weight, Adjusting Strokes and Fills* *Guides, SmartGuides, Align/Distribute*	3.4 Due 3.5 Illustrator Compositing *3.5 Daily Quiz Due*

W	NOV 4	**Layouts in InDesign**	InDesign–Creating and Exporting Documents *Select (V), Direct Select (A), Text Tool (T)* *Place (CTRL+D), Relink, Update* *Guides, Align/Distribute* *Pages and Master Pages, Editing Master Page Elements (CTRL+SHIFT+LMB)* *Export (CTRL+E)*	3.5 Due 3.6 Indesign Layout *3.6 Daily Quiz Due*
PROJECT 4				
M	NOV 9	**Creating Custom Geometry in Grasshopper II**	GH-Creating Points *Construct Point, Populate2D, Populate3D, Grids* GH-Creating Curves *Polyline, Nurbs Curve, Interpolate, Tween Curve* GH-Lists: Joining and Merging *Panel, Param Viewer, Join Curves, Merge* GH-Lists: Selecting Items *List Item* GH-Editing Curves *Fillet, Flip Curve* GH-Creating Surfaces *Loft, LoftOptions*	**Project 3 Due** 4.1 Custom Geometry *4.1 Daily Quiz Due*
W	NOV 11	**Creating Custom Geometry in Grasshopper II**	GH-Sweeping Structural Shapes *Pipe, EvalCurve, PerpFrame, Sweep1* GH-Creating Substructure *Divide Curve*	4.1 Due 4.2 Primary and Secondary Structure *4.2 Daily Quiz Due*
M	NOV 16	**GH Parametric Sectional Shape**	**Parametric Design in Grasshopper** GH-Creating a Parametric Sectional Shape	4.2 Due 4.3 Parametric Section *4.3 Daily Quiz Due*
W	NOV 18	**Defining Variables in Grasshopper**	GH-Creating Custom Variables with Sliders GH-Driving Variables with Mathematical Functions *Graph Mapper, Bounds, Construct Domain, Remap Values* GH-Driving Variables with Geometric Relationships *Distance, Length, Curvature, Surface Curvature*	4.3 Due 4.4 Parametric Variations *4.4 Daily Quiz Due*

		Representing Variables in Grasshopper	GH-Using Gradients to Show Variables *Gradient, Deconstruct Domain, Custom Preview, Custom Material, Object Bake (Lunchbox), Boolean Toggle*	4.4 Due 4.5 Parametric Representations *4.5 Daily Quiz Due*
M	NOV 23	**GH Parametric Volume**	GH-Creating a Parametric Volume	4.5 Due 4.6 Parametric Volume *4.6 Daily Quiz Due*
W	NOV 25	THANKSGIVING—NO CLASS		
M	NOV 30	**Work Session**		
W	DEC 2	**Work Session**	Last Day of Class	**Project 4 Due**
M	DEC 7	**Final Exam**		**Digital Submission Due**

REQUIRED TEXTS

There are no required textbooks. Students are encouraged to consult the following sources. Additional resources will be made available via the course website.

RECOMMENDED TEXTS:

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

Aranda, Ben and Chris Lasch. Pamphlet Architecture 27: Tooling. New York: Princeton Architectural Press, 2005.

Carpo, Mario, ed. The Digital Turn In Architecture *1992-2012*. John Wiley & Sons, 2013.

Carpo, Mario. The Second Digital Turn: Design Beyond Intelligence. MIT Press, 2017.

Burry, Mark and Jane Burry. Prototyping for Architects

PRECEDENTS

Westside Convergence, Reiser Umemoto

London Aquatics Center, Zaha Hadid Architects

Metropol Parasol, Jurgen Mayer H

Southern Cross Station, Grimshaw

Heath Robinson Museum, ZMMA

Santa Caterina Market, Enric Miralles

Louisiana State Museum and Sports Hall of Fame, Trahan Architects

OTHER RESOURCES

Foundations: Grasshopper Primer, Third Edition (Digital).

Available for download at http://modelab.is/grasshopper-primer/

Rhino Commands:

https://docs.mcneel.com/rhino/6/help/en-us/commandlist/command_list.htm

Rhino Tutorials:

https://www.rhino3d.com/tutorials

Rhino Help:

https://docs.mcneel.com/rhino/6/help/en-us/index.htm

Grasshopper Component Index:

http://grasshopperdocs.com/completeIndex.html

Grasshopper Plugins:

https://www.food4rhino.com/

https://provingground.io/tools/lunchbox/

Grasshopper Tutorials:

https://www.grasshopper3d.com/page/tutorials-1

AutoCAD Aliases for Rhino:

https://wiki.mcneel.com/rhino/acadaliases

Digital media lab printer, lasercutter, and other instructions

http://www.depts.ttu.edu/elpaso/arch/student-resources/digital-media-lab.php

TTU El Paso Lasercutter templates and jobs:

http://elpasoweb.arch.ttu.edu/lasercutter/

Single stroke engraving fonts:

https://wiki.mcneel.com/rhino/engravingfonts

CutePDF-PDF Print Driver

https://www.cutepdf.com/

COURSE REQUIREMENTS

Computer Requirements

Each student needs to have a personal laptop from the first day of class. Students must acquire a laptop to practice and perform their assignments. It is important that all work produced be backed-up on a regular basis.

• Latest student computer minimum specifications are available at: https://www.depts.ttu.edu/architecture/coa-resources/incoming/Computer_Requirements.php

Software Requirements

Rhino 6 (Incl. Grasshopper) AutoCAD, Adobe Creative Cloud (Illustrator, Photoshop, InDesign & Acrobat Pro) or Adobe Creative Suite 5–6 Design Standard, Apple iWork / MS Office and Dropbox / Google Drive. **Please note: Rhino 5 will not be supported in class—if you have an older version of the software, please upgrade**. Proficiency with AutoCAD, Photoshop, Illustrator and Acrobat Pro is expected in this course. Other software (plug-ins) may be referenced, and/or required throughout the semester by the instructor. **Please be advised, using unauthorized or trial copies of software will cause unexpected results and will not be an excuse for delay of assignment deadlines.**

Rhino 6 is available from McNeel at educational pricing ($195) at https://www.rhino3d.com/sales/north-america/United_States

Rhino 6 is available from Creation Engine at discounted pricing ($139.95) at https://shop.creationengine.com/products/rhino-6-education-version

GRADING

Grading is a certification that the student has clearly demonstrated a level of expertise as required in each assignment or exercise. All requirements and deadlines must be completed on time. Grades are defined as follows:

A—*Excellent*: Exceptional performance; strongly exceeding the requirements of the course, showing strong academic initiative & independent resourcefulness

B—*Good*: Performance above the norm; accurate, complete, and beyond the minimum requirements of the course; work

demonstrates marked progress and initiative.

C—*Average*: Satisfactory work; adequately meets minimum requirements and demonstrates satisfactory understanding,

skills, and effort; little initiative to investigate the problem without substantial prodding of the instructor; work shows little improvement.

D—*Inferior*: Passing but does not adequately satisfy minimum requirements; demonstrates minimum understanding, skills, and effort; initiative lacking; improvement not noticeable.

F —*Failing*: Does not meet minimum requirements; and fails to demonstrate understanding, skills and effort.

Late And Incomplete Work

Assignments are expected to be completed and submitted by the due date communicated in class. There will be no extensions to due dates. Any project submittal turned in late will receive a maximum of 50% credit up to the first week late, and 0% credit thereafter. Any substantially incomplete work or submission will not be graded until substantially complete, and will incur the late grading penalty according to the time it is submitted.

NAAB STUDENT PERFORMANCE CRITERIA

A.1 Professional Communication Skills. Ability to write and speak effectively and use representational media appropriate for both within the profession and with the general public.

A.4 Architectural Design Skills: Ability to effectively use basic formal, organizational and environmental principles and the capacity of each to inform two- and three-dimensional design.

ATTENDANCE POLICY

Students are responsible for attending all schedule class meetings for the full class period. Once a student reaches two unexcused absences they will be asked to meet with instructor. A total of four absences is considered excessive, requiring the student to drop the class or receive a grade of "F" in compliance with the drop deadlines. All absences are considered unexcused except for absences due to religious observance or officially approved trips. See TTU CoA Absence Policy.

Note: Failure to work in class with undivided attention, the lack of appropriate tools and materials, any tardiness, leaving early, lack of participation, general socializing, disruptive behavior, etc. will be regarded as absences. You are not allowed to work on assignments from other classes during this class.

COVID-19 INFORMATION

We do not plan to conduct any face-to-face sessions, all sessions for this course will be held online.

Face coverings are required.

Texas Tech University requires that students wear face coverings while in classes, while otherwise in campus buildings, and when social distancing cannot be maintained outdoors on campus.

Signage.

Be attentive to signage posted at external and some classroom doorways that indicates entry and exit ways, gathering and queuing spaces, and availability of masks and hand sanitizer.

Seating assignments.

The purpose of assigned seating is to assist in contact tracing, if necessary, and to augment social distancing. Students are expected to sit at a minimum of six feet apart. There will also be an orderly procedure, designed to ensure social distancing, for exiting the classroom.

We do not plan to conduct any face-to-face sessions.

Illness-Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are encouraged not to attend face-to-face class meetings or events. Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness.

1. If you are ill and think the symptoms might be COVID-19-related:

a. Call Student Health Services at 806.743.2848 or your health care provider. After hours and on weekends contact TTU COVID-19 Helpline at 806.743.2911.

b. Self-report as soon as possible using the Dean of Students COVID-19 webpage. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.

c. If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.

d. If your illness is determined not to be COVID-19-related, please follow steps 2.a-d below.

2. If you are ill and can attribute your symptoms to something other than COVID-19:

a. If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.

b. During the health provider visit, request a “return to school” note;

c. E-mail the instructor a picture of that note;

d. Return to class by the next class period after the date indicated on your note.

Following the steps outlined above helps to keep your instructors informed about your absences and ensures your absence or missing an assignment due date because of illness will be marked excused. You will still be responsible to complete within a week of returning to class any assignments, quizzes, or exams you miss because of illness.

If you have interacted with individual(s) who have tested positive for COVID-19:

Maintain a list of those persons and consult Student Health Services at 806-743-2911 or your primary care provider on next steps.Do not return to class until you are medically cleared by your Health Care Provider.

SAVING AND BACKING UP YOUR WORK

Computers are prone to viruses, crashes, server and network problems. All work should be saved regularly and in duplicate locations. Lost or corrupted files will not be an excuse for not producing or delivering coursework or projects. Your backup routine should include the following:

• **Download and Install a Cloud Service** for file backup, which will sync files saved locally on your PC to the Cloud. (Google Drive offers Backup and Sync, which you can install here: https://www.google.com/drive/download/). Create a dedicated folder for the course on your PC, and ensure that this folder is set to sync regularly with the Cloud Service. Connect to the Cloud Service at Sync regularly, at minimum at the end of each worksession.

• **Use Autosave** functions in all software to automatically save your files every few minutes while you work. For details on the Autosave function in Rhino, visit http://docs.mcneel.com/rhino/5/help/en-us/commands/autosave.htm

• **Save Frequently** as you work – get in the habit of using keyboard shortcuts (CTRL+S) to save your work before and after processor-intensive tasks

• **Do Not Overload Your Processor** minimize using multiple, graphic-intensive software programs simultaneously, and keep 'clean' files with only the most current work

• **use a Flash Drive - 16GB (min)** to save key files at ey project benchmarks

• use an External Hard Drive for data backup (optional)

• Technical difficulties, hardware failures, viruses, crashes, server problems, print lab problems, or corrupted files will not be accepted as legitimate excuses. **ALL WORK SHOULD BE CONTINUOUSLY SAVED AND REGULARLY BACKED UP.**

EMAIL + COURSE WEBSITE

Course content and other announcements will be communicated via email and/or on the course website. Students are expected to regularly check their TTU email and the Course Website for updates. Smartphone users should consider installing related apps to receive timely notifications of posted or emailed content.

RELATED LECTURES AND EVENTS

As part of this semester's lecture series, several noted practitioners with expertise in digital media and fabrication may visit the school. Events in and around El Paso concerning the subject matter of the course may also be offered. Attendance at these events, while not required, is strongly encouraged to enrich your learning in the course.

POLICIES AND PROCEDURES

- Student Handbook
- Code of Student Conduct
- TTU Undergraduate & Graduate Catalog
- Academic Regulations

ADA STATEMENT:

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

ACADEMIC INTEGRITY STATEMENT:

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University ("University") Quality Enhancement Plan, Academic Integrity Task Force, 2010]

In this course, you will be asked to complete tutorials and other assignments, which may share many similarities with the work of your classmates. It is expected that you each work *individually* to follow the tutorial assignments and produce your own original models, drawings, and other required output, working 'from scratch' from the instructions and material provided in the assignment or tutorial.

You may also be asked to use 'reference drawings' of existing buildings or structures to complete your work. It is expected in this case that you work from the reference images to construct your own, original digital drawing 'from scratch'. Importing vector or CAD linework into your file, if it had been produced by another author is not allowed for this course.

You may be asked to find and work with Grasshopper (GH) files, or other scripts or portions of computer code which may have been developed by other authors, including your classmates. Such intellectual property is often, but not always, provided as 'open source' material, free for your use to adapt to your needs. It is your responsibility to credit the appropriate authors if using any portion of file, script, or code developed by someone else, and to ensure your use is fair use under the terms by which the author provided the material.

Any student whose work has significant similarities to the digital models, drawings, images, or physical material of another student, individual, or entity will receive 0% credit for each assignment showing such similarities, and will be referred to the university officials for possible disciplinary action.

The full description of the University Academic Integrity policy is available here:

http://www.depts.ttu.edu/studentconduct/academicinteg.php

RELIGIOUS HOLY DAY STATEMENT:

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

DISCRIMINATION, HARASSMENT, AND SEXUAL VIOLENCE STATEMENT:

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/scc/(Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/rise/ (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931,http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)

CIVILITY IN THE CLASSROOM STATEMENT:

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

LGBTQIA SUPPORT STATEMENT:

I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that

additional resources are available through the Office of LGBTQIA within the Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433."

STUDENT WORK

The College of Architecture reserves the right to retain, exhibit, and reproduce work submitted by students. Work submitted for a grade is the property of the college. For exhibition purposes keep all materials available for the instructor at the end of the semester.

ARCHITECTURE BUILDING POLICIES/PROCEDURES & STUDIO CULTURE

Students must comply with ALL requirements as posted on the college website.

Room Requirements

- No cell phone use in the classroom during class hours is permitted
- No eating in class, however bottled drinks are permitted; ensure to keep drinks capped and away from computer and electronic components at all times.