

Advanced Architectural Technology II

ARCH 5334 (3 credit hours)

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Course Information

Architecture 5334. Computation, Design, Fabrication Elective

Credits: 3 semester credit hours

Meeting Time: Mondays 5:00 pm – 7:50 pm

Meeting Place: Online

Catalogue Description

The course will provide a fundamental, conceptual, and historical lineage of advanced computational technologies and tools, and techniques that explores a spectrum of practices in design, assembly, prototyping, fabrication, and manufacturing in recent development of the area of computational design, advanced design research, and digital fabrication. While providing a history of computational design and computer-aided design, this course also seeks to advance student involvement in innovative practices and to encourage student investment as a central concern of practice. This course requires some background in digital modeling.

Learning Objectives

Successful completion of this course will enable students to understand the fundamentals of:

- 1) using advanced tooling including robotics in order to push the limits and discover new material modes,
- 2) by encouraging students towards discovery and innovation in fabrication and assembly methods through hands-on interactions with advanced methods,
- 3) while searching for ways to define practices with a critical sense of fabrication and assembly and beyond.

Methods of Assessing Learning Outcomes

The expected learning outcomes will be assessed through the evaluation of assignments, in-class activities, and class discussions including attendance.

The final submission of the course will be the plan/description as well as the design of a small piece in 1:1 scale that represents innovative methods of material fabrication integrated with problem-solving at the level of detail and assembly, especially in relation to the students' studio projects. Due to the current pandemic situation, there may be some changes and adjustments in the exact format of the final submission.

Reading & References

(Additional references will be added as needed. For most books, any edition will suffice unless specified in class.)

- *The Evolution of Technology*. George Basalla. Cambridge University Press, 1988.
- *The Information: A History, a Theory, a Flood*. James Gleick. Pantheon Books, 2011
- *Envisioning Information*. Edward Tufte. Graphics Press, 1990.
(esp. chapter 2 micro/macro reading, chapter 3, layering and separation, chapter 5 color and information)
- *Visual Explanation: Images and quantities, evidence and narrative*. Edward Tufte. Graphics Press, 1997.
- *The Semiology of Graphics*. Jacques Bertin. Esri Press, 2010
- *You Are Here: Personal Geographies and Other Maps of the Imagination* (Imagined Maps Around the World, Collection of Artists Maps). Katharine Harmon. Princeton Architectural Press, 2003
- *The ArcGIS book: 10 big ideas about applying the science of where* (available online) <https://learn.arcgis.com/en/arcgis-book/chapter2/>
- *Essentials of geographic information systems* (available online) https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/index.html
- *Architecture's New Media: Principles, Theories, and Methods of Computer-Aided Design*. Yehuda E. Kalay, MIT Press Cambridge, MA, USA 2004
- *The Sciences of the Artificial*. Herbert Simon, MIT Press Cambridge, MA 1969. (esp. The science of Design: Creating the Artificial)
- *The Robotic Touch: How robots change architecture*. Gramazio & Kohler. Park Books, 2014
- *Architectural Robotics: Ecosystems of bits, bytes, and biology*. Keith Evan Green. MIT Press, 2016
- *Fabricate: Negotiating design and making*. Gramazio & Kohler. GTA Verlag, 2014
- *Integrating Innovation in Architecture: Design, methods and technology for progressive practice and research*. Ajla Aksamija (Ed.). John Wiley Sons, 2016

- *Inside Smartgeometry: Expanding the architectural possibilities of computational design.* Brady Peters & Terri Peters (Eds.). John Wiley Sons, 2013
- *Material Innovation: Architecture.* Andrew Dent & Leslie Sherr. Thames & Hudson, 2014
- *Architectural Metal Surfaces.* L. William Zahner. John Wiley & Sons, 2005
- *Fibre Cement: Technology and design.* Jan R. Krause. Berkhauser, 2007
- *Materials: Innovation and design.* Dimitris Kottas. Linksbooks, 2011

Attendance Policy

1. Students are responsible for attending all scheduled class meetings for the full class period.
2. If you are sick, please stay home. Inform the instructor directly.
3. A maximum of four absences is considered excessive, requiring the student to drop the class or receive a grade of “F” in compliance with drop deadlines (see CoA Attendance policy).
4. Any absence is considered UNEXCUSED, unless it meets the criteria discussed in the TTU Student Handbook, Part II Community Policies, Section D: Class Absences (page 62) for the following:
 - Illness requiring an absence from class for more than one week.
 - Religious Holy Day Absences.
 - Student Absence due to Sponsorship of Student Activities and Off-Campus Trips.

Whether an absence is excused or unexcused is determined solely by the instructor except for absences due to religious observance and officially approved trips described above.

5. Arriving late to class, working on anything other than class work and departing early will be considered as absences.

Assignments

Each student is responsible for reading, understanding, and absorbing all lectures, assignments, exercises, references, and other content presented in class. Readings and assignments are cumulative, therefore students who are unable to keep up with the course schedule might have to withdraw.

Submission of Work

Due to the Covid-19 situation, all submission will be in digital format. The method of submission will be announced during the class time. In general, the time associated with the uploaded (or sent if through email) files will be considered as the time of submission.

Due Dates

All assignments must be completed on time, as posted for each assignment. Extensions to due dates will not be granted unless for PRE-ARRANGED circumstances. Expect a substantial reduction of grade for late or incomplete work. A penalty range of 3-10 points (out of 100) is deducted from an assignment for each instance of a late or incomplete submission. Work not

submitted after 24 hours from the specified time the assignment is due receives a grade of 0 for the assignment.

Grading Criteria

Evaluation of student performance is based upon quality of the assignment, class participation, as well as product. The assessment of student performance will be conducted multiple times throughout the semester and at mid-term and final. This is not an exact mathematical assessment. It is based on years of experience and expertise in the criticism and judgment of student work, taking into consideration:

1. Strength and depth of ideas and understanding on the subjects
2. Logic & structure, development & articulation of ideas, and communication
3. Active & proactive participation during the class activities and discussions
4. Critical thinking

Grade report includes an evaluation for each assignment on a 0–100 scale, weighted, resulting in an overall average for each report.

Reading assignment followed by in-class discussion (Multiple): 30 % of semester grade

Scripting exercise: 25 % of semester grade

Final (Project plan/description): 30 % of semester grade

Attendance and class participation: 15% of semester grade

Grade equivalencies and definitions

A+	90-100	B+	87-89	C+	77-79	D+	67-69	F	0-60
A	94-96	B	84-86	C	74-76	D	64-66		
A-	90-93	B-	80-83	C-	70-73	D-	60-63		

Grade definitions

A (excellent) exceptional performance; strongly exceeding the requirements of the course, showing strong academic initiative and independent resourcefulness.

B (good) performance above the norm; accurate and complete; beyond the minimum requirements of the course; work demonstrates marked understanding, skills, initiative, effort and improvement.

C (average) satisfactory work that adequately meets minimum requirements and demonstrates satisfactory understanding, skills, and effort; little initiative to investigate the problem without substantial prodding from the instructor; work shows minimal improvement.

D (inferior) does not adequately satisfy minimum requirements; demonstrates minimum understanding, skills, and effort; initiative lacking; improvement not noticeable.

F (failure) does not demonstrate understanding, skills, and effort; no improvement.

I (incomplete) I is given only when a student's work is satisfactory in quality but, due to reasons beyond his or her control, has not been completed during the regular semester.

W (withdrawal)

R (repeated to remove an I) designates a course repeated to remove an I.

The professor reserves the right to refuse to grade work that is incomplete, extremely late, does not meet requirements, is substantially inferior in quality, or is poorly displayed. Any work submitted after the time and date scheduled will receive a reduction in grade, unless the circumstances-documented illness or death, unusual acts of nature, family crisis-warrant consideration by the faculty and constitute a valid justification.

Retention of 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.

Course Schedule by Week

(Subject to changes according to TTU/CoA events and more)

WEEK	WEEK OF	AGENDA		NOTES
1	25-Jan	Introduction	Class Introduction	Reading handout
2	1-Feb	Information Representation	Homo Habilis, Evolution of Technology	
3	8-Feb		Information vs. Data & Representation	
4	15-Feb	Computational Design and Design Research	Information vs. Data & Representation (cont.)	
5	22-Feb		Brief overview of CAD/Computational Design	
6	1-Mar	Tools: Digital Fabrication Fundamental	Design, Science, Engineering and Research	
7	8-Mar		Overview of Digital Fabrication tools	Potential demo. Date tentative
8	15-Mar	Tools2: Design Methods and Scripting	CAD revisited, 3D printer, Toolpath and G-code	
9	22-Mar		Design methods, Parametric modeling, grasshopper intro	
10	29-Mar		Grasshopper basics	
			Scripting and Fabrication	Scripting Exercise Due (date tentative)
11	5-Apr		No Class	University Calendar
12	12-Apr	Design and Process	Robot demo	Date tentative
13	19-Apr		Case study 1	Final submission announcement
14	26-Apr		Case study 2	
15	3-May	Technology and Design	Modeling and Prototyping, Technology as Design Methods	
16	Between May6-11	Final Submission	Final Assignment Submission	Date & Format TBD

INSTITUTIONALLY REQUIRED INFORMATION

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]

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.

INSTITUTIONALLY SUGGESTED INFORMATION

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 RESOURCES

Office of LGBTQIA, 806.742.5433, Student Union Building Room 201 www.lgbtqia.ttu.edu
Within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.

PRINT, SIGN AND SUBMIT THIS PAGE

I have read the syllabus for ARCH 5334 Advanced Technology II, Spring 2021, and I understand the course policies and requirements as they are stated. I have made particular note of the statements listed above and understand that while they represent important aspects of the course, they do not represent the entirety of the syllabus.

Student's Name: _____ (printed)

_____ (signed)

Today's Date:

Please submit this completed and signed page to Professor Key by the end of class on Monday, February 8th, 2021.

Appendix: COVID-19 INFORMATION

This class meets online. However, students want to make sure that they are safe and well all throughout the semester by following the general guidelines below.

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 the exiting classrooms. Refer to the Guidebook distributed at the All School Meeting on August 24th, 2020.

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.