COVID HEADER

If Texas Tech University campus operations are required to change because of health concerns related to the COVID-19 pandemic, it is possible that this course will move to a fully online delivery format. Should that be necessary, students will need to have access to a webcam and microphone for remote delivery of the class. Additionally, students will need to have access to Blackboard, Zoom, & Raider Email.

ARCH 3602 ARCHITECTURAL DESIGN VI

COLLEGE OF ARCHITECTURE, TEXAS TECH UNIVERSITY

SPRING 2021

INSTRUCTORS

Catherine Söderberg Esper, Coordinator, Visiting Assistant Professor, catherine.soderberg@ttu.edu
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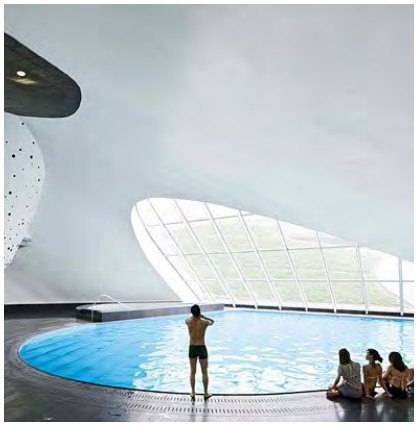
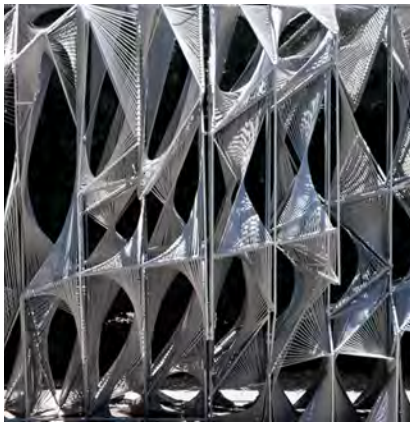


Giant Interactive Group by Morphosis; ScreenPlay by Olyer Wu Collaborative; Palazzetto dello Sport by Pier Luigi Nervi

COURSE TITLE

NATATORIUM

CATALOG DESCRIPTION

Prerequisite: ARCH 3601. Focuses on how architectural concepts and ideations translate into built environments that affect the public realm. Open only to architecture majors or to students having permission of the Dean.

COURSE DESCRIPTION

The studio will explore a direct relationship between water systems, materiality, geometry, and structure. Students will use advanced digital modeling tools in combination with material geometries to design a natatorium, or a public pool facility. The studio will work at multiple scales, from water scarcity issues on site, to tectonic logics of the building, to advanced material behaviors. The program is selected as a vehicle for engaging unconventional structural systems, such as cantilevers and long spans, as well as lightweight material composites (carbon fiber reinforced concrete, EFTE) to advance and update a well-established architectural typology. The final, 40,000 SF, project located in downtown El Paso, will include public and private spaces and well-developed mechanical and structural systems that facilitate access to communal swimming and exercise.

WATER INFRASTRUCTURES

The studio proposes that, by understanding the complexities of water infrastructure for natatoria, new architectural forms might emerge. The studio will analyze the dense network of systems for high-capacity contemporary aquatic centers as they relate to the supply, flow, treatment, filtering, and storing of water. Additionally, sanitary provisions, flood prevention protocols, chlorination systems and sewage and waste management methods will be analyzed. Students will also study and document conditions of hydrostatic pressure present in each of the various pools of their selected precedents. Hydrostatic pressure is the pressure that is exerted by a fluid at rest at a given point within the fluid, due to the force of gravity.[1]

FIBROUS STRUCTURES

Fibrous materials are ubiquitous. Nature makes extensive use of the fibrous form of matter because fibers are extremely flexible, allowing for complex shapes to be formed.[2] Biology offers lessons in hyper efficient resources. Biomimicry is the imitation of the models, pattern systems, and elements of nature for the purpose of solving complex human problems. Biomimicry in architecture is the practice of designing buildings that simulate processes that occur in nature. Carbon fiber will be the material of investigation throughout this studio. These fibers are extremely fine and may be assembled into yarns, woven into fabrics and then cured to form lightweight composites. Carbon fiber is lighter in weight and five times stronger than steel. According to Mexican-born material theorist, Manuel de Landa, *'materials are not inert receptacles for a cerebral form imposed from the outside, but active participants in the genesis of form.'* Students will reference examples of fibrous structures in nature to explore the formal capabilities of carbon fiber and generate geometric explorations of structural systems through progressive sections. The dense programmatic requirements of the natatorium and the compact downtown site nestled between existing buildings will challenge students to innovate with the formal engineering, structural logic and materiality of their aquatic center.

PROJECT 1 | FLUID DYNAMICS (1.5 Weeks)

Students will work partly in teams of two to conduct a shared analysis of a contemporary natatorium. Students will analyze spatial relationships, structural typologies and complex water infrastructures as they relate to their building precedent. Students will document how their building is designed to manage, contain, treat, move and disperse water. Each student will produce a speculative hybrid model of their precedent within a given vertical volume using physical and digital models.

PROJECT 2 | FIBROUS FORMS (2 Weeks)

Each student will work individually to iterate geometric explorations through related investigations at two scales- the microfiber placement and the macro fibrous form. Students will conduct an analysis of a fibrous structure in nature. Guided by biomimicry, students will generate spatial sequences by means of progressive sections using digital parametric modeling tools. Students will explore the flexible properties of carbon fiber by digitally generating and physically modeling complex geometries at multiple scales- from the large scale structural spanning unit to the small scale CFRP concrete basins.

PROJECT 3 | URBAN FLOWS (1.5 Weeks)

Students will work in groups to research, synthesize, and draw various modes of flows at the site and urban scale. The proposed site is a pairing of two adjacent lots in downtown El Paso at the corner of

[1] "What is Hydrostatic Pressure -- Fluid Pressure and Depth." https://www.edinformatics.com/math_science/hydrostatic_pressure.htm. Accessed 19 Jan. 2021.

[2] "Fibrous Materials." https://books.google.com/books?id=KrcjDAAAQBAJ&pg=PR11&lpg=PR11&dq=Nature+makes+extensive+use+of+the+fibrous+form+of+matter+because+fibers+are+extremely+flexible,+allowing+for+complex+shapes+to+be+formed.&source=bl&ots=ll1WY-zKFQ&sig=ACfU3U0D4dTIi8rc39rwBsmj_dvVz17aCg&hl=en. Accessed 18 Jan. 2021.

frequented San Jacinto plaza. Students will build a detailed digital model of the site and vicinity with existing buildings and topographic information. The final mappings will address accessibility and circulation, privacy and views, solar exposure and hydrogeology at the local scale- including above ground drainage flows and underground water networks.

PROJECT 4 | NATATORIUM (8 Weeks)
Students will complete the design of the natatorium. An innovative carbon fiber application for a structural and formal logic; a complex water infrastructure; and a well researched understanding of the various public and private programmatic spaces will makeup the final design. Projects will be developed through detailed architectural models and drawings.

STUDENT LEARNING OBJECTIVES

1. To develop the ability to analyze architectural precedents in order to draw significant information regarding constructability, structure, and material.
2. To develop the ability to research fabrication methods used to innovate with lightweight materials.
3. To develop an ability to use parametric modeling paradigms to inform the design process.
4. To develop the ability to identify, distinguish, separate and incorporate private and public activities into an architectural design solution.
5. To develop an ability to integrate building systems with an emphasis on structural members and tectonic envelopes.

STUDENT PERFORMANCE OBJECTIVES

1. To develop an understanding of innovative lightweight materials for structure and reinforcement applications.
2. To develop the ability to digitally model complex spatial forms.
3. To develop the ability to translate conceptual architectural iterations into a complete building that has a clear structural order, tectonic identity, materiality, programmatic requirements, circulation, envelope and detailing.
4. To develop the ability to clearly draw site plans, floor plans, site/building sections that respond to site characteristics and urban context.

MEANS OF EVALUATION

1. Deliverables

Weeks 1+2	Project 1
Weeks 3+4	Project 2
Weeks 5+6	Project 3
Week 7	Mid Term Review
Week 8	Project 4, Iterate Formal Geometries
Week 9	Finalize a Structural Logic
Weeks 10+11	Finalize 3D Model
Weeks 12+13	Finalize Plans, Sections and Elevations
Week 14	Renderings and Final Production
Week 15	Final Review

2. Methods of Assessment
    a. Completion of deliverables in a timely manner
    b. Thoughtful engagement with critical questions regarding context

TEACHING METHODS

1. Case Study Analysis
2. Material Research
3. Digital Mapping
4. Form-finding with Computational Tools

COURSE SCHEDULE

	S	M	T	W	R	F	S
1	17	18	19	Jan 20 Classes Begin **First Day of Studio** **Intro to P1**	21	22 Zoom Session 1:30-4:50	23
2	24	25 Zoom Session 1:30-4:50	26	27 Zoom Session 1:30-4:50 **P1 Progress** **Joint Mural Pin Up**	28	29 Zoom Session 1:30-4:50	30
3	31	Feb 1 In-Person Meeting* **P1 Pin Up** **Intro to P2**	2	3 Zoom Session 1:30-4:50	4	5 Zoom Session 1:30-4:50	6
4	7	8 Zoom Session 1:30-4:50	9	10 Zoom Session 1:30-4:50	11	12 Zoom Session 1:30-4:50	13
5	14	15 In-Person Meeting* **P2 Pin Up** **Intro to P3**	16	17 Zoom Session 1:30-4:50	18	19 Zoom Session 1:30-4:50	20
6	21	22 Zoom Session 1:30-4:50 **P3 Due** **Joint Mural Pin Up** **Intro to P4.1**	23	24 Zoom Session 1:30-4:50	25	26 No Class	27
7	28	Mar 1 In-Person Meeting* **P4.1 Progress Pin Up**	2	3 Zoom Session 1:30-4:50	4	5 **Mid Term** **Review**	6
8	7	8 Zoom Session 1:30-4:50 **Intro to P4.2**	9	10 Zoom Session 1:30-4:50	11	12 Zoom Session 1:30-4:50	13
9	14	15 In-Person Meeting* **P4.2 Progress Pin Up**	16	17 Zoom Session 1:30-4:50	18	19 No Class	20
10	21	22 Zoom Session 1:30-4:50	23	24 Zoom Session 1:30-4:50 **P4.2 Progress** **Joint Mural Pin Up**	25	26 Zoom Session 1:30-4:50	27
11	28	29 In-Person Meeting* **P4.2 Progress Pin Up**	30	31 Zoom Session 1:30-4:50	Apr 1	2 Zoom Session 1:30-4:50 **P4.2 Progress** **Joint Mural Pin Up**	3

12	4	5 No Class	6	7 Zoom Session 1:30-4:50 **P4.2 Progress** **Joint Mural Pin Up**	8	9 Zoom Session 1:30-4:50	10
13	11	12 In-Person Meeting* **P4.2 Progress Pin Up**	13	14 Zoom Session 1:30-4:50	15	16 Zoom Session 1:30-4:50	17
14	18	19 Zoom Session 1:30-4:50 **P4.2 Progress** **Joint Mural Pin Up**	20	21 Zoom Session 1:30-4:50	22	23 Zoom Session 1:30-4:50	24
15	25	26 **Final** **Review**	27	28	29	30	May 1

*Please note, all in-person meeting dates are subject to change due to COVID-19 updates.

REQUIRED TEXTS

Selected readings will be assigned throughout the semester, to be provided by instructors.

The Rhetoric of Pier Luigi Nervi: Forms in Reinforced Concrete, Alberto Bologna (EPFL Press, 2016)
Beauty's Rigor: Patterns of Production in the Work of Pier Luigi Nervi, Thomas Leslie (Illinois Press, 2017)
Finding Form: Towards an Architecture of the Minimal, Frei Otto, Bodo Rasch (Angel Menges, 1996)
Eladio Dieste: Innovation in Structural Art (Princeton, 2004)
Fibrous and Composite Materials for Civil Engineering Applications, R Fanguerio (Woodhead, 2011)
Fibrous Materials 2nd Edition, Krishan Chawla (Cambridge 2016)
Building Construction Illustrated, Francis D. K. Ching (Wiley, 2008)
Architectural Graphic Standards (Wiley, 2007)

COURSE REQUIREMENTS

Arch 3602 requires substantial dedication and investment of student time, skill, and critical thought both during and after official studio hours. Students are required to have a personal computer which meets the school's minimum requirements. Technical difficulties, viruses, crashes, server and print bureau problems, or corrupted files will not be accepted as legitimate excuses. ALL WORK SHOULD BE CONTINUOUSLY SAVED AND REGULARLY BACKED UP.

GRADING

Grades will be calculated as follows:

Project 1 **15%**
Project 2 **15%**
Project 3 **15%**
Project 4 **20%**
Final Review **35%**

NAAB CRITERIA

A.1 Professional Communication Skills (Ability)
A.2 Design Thinking Skills (Ability)
A.6 Use of Precedents (Ability)
B.3 Codes and Regulations (Ability)

B.4 Technical Documentation (Ability)

ATTENDANCE POLICY

Students are responsible for attending all scheduled class meetings for the full class period. Class meetings include all course meeting times, reviews, and online sessions. Once a student reaches two unexcused absences, they will be asked to meet with the instructor. A total of four absences in a studio, or in a lecture class that meets two or three times per week, 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.

II. COVID-19 INFORMATION

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.

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 healthcare 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 healthcare 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.

3. 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 Healthcare Provider.

III. UNIVERSITY REQUIRED STATEMENTS

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.

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."

TEXAS TECH UNIVERSITY
Student Affairs

COVID-19 Positive Student Test Notification and Protocol

Student Exhibits Symptoms for COVID-19

Fever or chills; Cough; Difficulty breathing; Fatigue; Muscle or body aches; Headache; New loss of taste or smell; Sore throat; Congestion or runny nose; Nausea or vomiting; Diarrhea

No

Student Should **Practice Physical Distancing**, Make Use of Appropriate Personal Protective Equipment as Expected by the University, and Continue to Attend Classes Until Notified Otherwise. Student Should Refer to the Texas Tech Commitment.

Exposed. Student had Close Contact (within 6 Feet for 15 Minutes or More in the Last 48 Hours) with a Probable or Confirmed COVID-19 Person.

If Recommended by a Medical Provider to Quarantine, Student May Complete the TTU Office *of the* Dean *of* Students Support Form for Class Absence Notification, if Needed.

Notification to Class by the IoR if Determined with Contact Tracers that Notification of Exposure is Needed, and That Additional Information Will Follow.

Students should immediately isolate and call **Student Health Services at 806.743.2848** or their healthcare provider if they need to be tested, are showing symptoms, or think they have been exposed. If/when they receive a positive test, it should be reported to the **TTU COVID-19 Reporting Form**.

Student Tests for COVID-19

Student Tests Negative. If Recommended by a Medical Provider to Quarantine, Student May Complete the TTU Office *of the* Dean *of* Students Support Form for Class Absence Notification, if Needed.

Student Tests Positive

Notifications Occur:

- Lubbock County Health Department
- Office *of the* Dean *of* Students (ODoS)
- Student Health Services (SHS)
- Student Housing (for Students Living On Campus)

Cleaning and Sanitization Protocols Are Implemented by Appropriate Area

Illness-related **Notifications to Instructors of Record** (IoR) by Assoc. Deans through ODoS/SHS. Student May Complete the TTU Office *of the* Dean *of* Students Support Form for Class Absence Notification, if Needed. Students May Notify Their IoR's Directly About Positive Test Results to Expedite this Process.

Illness-related **Notifications to Students/Roommates** by Contact Tracing Team

Student/Roommate Quarantine Period

This document is intended to be a general guide. Circumstances regarding individual students will vary. For questions, please contact the Office *of the* Dean *of* Students at 806.742.2984.

Rev: 12/17/2020 12:44 PM