



## Earth Based Construction Systems Fall Semester 2020

**ARCH 5334 001** Advanced Studies in Construction Technology (3:2:2). Prerequisite: ARCH 3355. Approved technology elective dealing with the advanced study of technical building methods and means.

**Tuesday & Thursday 9:30 – 10:50am Online**

Ben K. Shacklette, AIA Associate Professor, Architecture Building Office 510, Academic Office Phone: 806-742-3136 ext. 260 Mobile: 806-392-6558  
Online Office hours: 11:00am-12:30pm Tu/Th OBA, [Ben.Shacklette@ttu.edu](mailto:Ben.Shacklette@ttu.edu)



Many types of earthen or “mud” based construction materials and systems are used around the world by a substantial portion of the global population, particularly in the rural villages and townships of the rapidly developing areas of the world. Lawrence Keefe, author of *‘Earth Building Methods & Materials, Repair & Conservation’* estimates that “at least 30% of the world’s population (over 2 billion people) live in houses constructed of raw earth.” Earthen building, often combined with numerous other construction methods and materials, plays a pivotal role in satisfying the urgent need for new buildings necessitated by population increases and migration patterns as seen throughout the world in developing countries today.

Contrastingly, there is growing interest in earth building systems in highly industrialized nations. Affluent societies are attracted to the aesthetic qualities, the sustainable aspects, and the energy efficient design properties of both modern and traditional earth building systems. Throughout human history, there is considerable experimentation, appropriation, and innovation in earth building spanning many extremes in region and climate, social and economic capacities, and cultural and political ideologies across the planet. Earth building is simultaneously global and local in both scope and scale.



Earth Based Construction Systems will study the historical development of earth architecture from ancient through modern times. Differing from region to region, and culture to culture, earthen construction is a material used of necessity and by choice. Earth or mud-based architecture can be classified in several basic construction types consisting of both pure and hybrid forms that vary in means, methods, and materials. Identifying and understanding the fundamental properties and tectonic capabilities of earthen construction systems is a focus of this course. Emphasis will be given to learning about how earth-based materials are made, why they are used in various construction systems in diverse cultures, how their use supports the conservation of the natural environment, and how contemporary earth-based building systems can improve the quality of life and raise the living standards of various peoples in the developing regions of the world. This course is designed to strengthen the student’s knowledge about the various forms of earth construction technology used in architecture and settlement building across the globe and encourages students to effectively disseminate this information through the creative and artistic presentation of research findings in written, verbal, and graphic exposition.

**Student Learning Outcomes:** Upon completion of this course students will be able to identify, understand, explain, and theorize applications for *Earth Based Construction Systems* according to the following criteria:

- Earth based dwellings are defined by systems of structure, enclosure, and circulation, articulated by the qualities of shape, color and texture, and determined by principles of scale, theories of proportion, aesthetics, and compositional arrangement.
- Earth based construction methods are classified by properties of materials, regional building conventions, and the available means of production and manufacturing.
- Earth construction practices reflect economic conditions, regional issues, social needs and aspirations, and cultural attitudes.
- Earth based dwellings can support ecological preservation considering the natural environment, climate, solar exposure, wind temperature, and precipitation, and can minimize negative environmental impact and support sustainable design strategies.



### **Arch 5334 Fall 2020 Course Requirements**

This course is a research based class that requires students to work as a class member participating in structured lectures. Each student will be evaluated on her or his ability to attend online lectures, complete test over the lectures, and complete research assignments on topics as assigned by the instructor. Each student will be evaluated on her or his scholarly merits, rigor and effort, and ability to communicate graphically, verbally, and in writing.

### **Assessment of Student Learning Outcomes**

80% Test on Lectures 4 tests x 20% each  
20% Research Project Report



## Arch 5334 Fall 2020 Course Schedule

### Week 1

Tuesday August 25

Thursday August 27

Course Introduction and Syllabus

Lecture 1: Earth Construction Global View

### SUN DRIED MUD BRICK

#### Week 2

Tuesday September 1

Thursday September 3

Lecture 2: Adobe/sun dried brick 11,000BC-1,000BC

Lecture 3: Adobe/sun dried brick 1,000BC-1,000AD

#### Week 3

Tuesday September 8

Thursday September 10

Lecture 4: Adobe/sun dried brick 1,000AD-present

Test No. 1 Lectures 1-4

### FIRED BRICK

#### Week 4

Tuesday September 15

Thursday September 17

Lecture 5: Fired or Burnt Mudbrick Construction 2,500 BC-1,400 AD

Lecture 6: Fired Brick Construction 1,400 AD -1875AD

#### Week 5

Tuesday September 22

Thursday September 24

Lecture 7: Modern Fired Brick Construction 1875AD - present

Test No. 2 Lectures 5-7

### RAMMED EARTH

#### Week 6

Tuesday September 29

Lecture 8: Rammed Earth 7,000BC-1,500AD

Thursday October 1

Lecture 9: Rammed 1,500AD-1,700AD

### MUD AND STICK

#### Week 7

Tuesday October 6

Thursday October 8

Lecture 10: Wattle and Daub, Quincha, Bousillage, PISE

Test No.3 Lectures 8-10

### TERRACOTTA, COMPOSITE, SOD & COB, EARTH BAG & EARTH BLOCK, EARTH MASS SYSTEMS

#### Week 8

Tuesday October 13

Thursday October 15

Lecture 11: Terracotta

Lecture 12: Modern Ceramic Lecture 13: Sod and Cob

#### Week 9

Tuesday October 20

Thursday October 22

Lecture 14: Earth Block & Earth Bag

Lecture 15: Earth Mass

#### Week 10

Spring Break

#### Week 11

Tuesday November 3

Thursday November 5

make up class as needed

Test No.4 Lectures 11-15

#### Week 12

Tuesday November 10

Thursday November 12

Research Report Presentations Group 1 Lectures 2-4

Research Report Presentations Group 2 Lectures 5-7

#### Week 13

Tuesday November 17

Thursday November 19

Research Report Presentations Group 3 Lectures 8-10

Research Report Presentations Group 4 Lectures 11-15

**Note: Due to the unfolding COVID-19 Crisis which may create unforeseen circumstances, this schedule may be altered accordingly.**

# Texas Tech University and College of Architecture Policies

**Academic Regulations:** Consult the Texas Tech University [2019-2020 Undergraduate and Graduate Catalog](#)

## Civility in the Classroom

Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class, resulting in an absence. [Statement of Ethical Principles](#)

## Academic Integrity Statement

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension. Academic integrity is taking responsibility for one's own class and/or coursework, 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 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 Quality Enhancement Plan, Academic Integrity Task Force, 2010] Students must understand the principles of academic integrity and abide by them in all classes and/or coursework. Academic integrity violations are outlined in the Code of Student Conduct, Part X, B3 of the Student Handbook. If there are questions of interpretation of academic integrity policies or about what might constitute an academic integrity violation, students are responsible for seeking guidance from the faculty member teaching the course in question. "Academic dishonesty" includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor(s) or the attempt to commit such an act). [TTU Academic Catalog: Academic Integrity](#)

## Attendance

Professor Shacklette will allow each student to have two unexcused absences during the semester. Two points will be deducted from the final grade for each additional unexcused absence. Arriving late to class, working on anything other than class work and departing early will be considered as absences. Absence due to religious observance: The Texas Tech University Catalog states that a student who is absent from classes for the observance of a religious holy day will be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. Notification must be made in writing and delivered in person no later than the 15th class day of the semester. Absence due to officially approved trips: The Texas Tech University Catalog states that the person responsible for a student missing class due to a trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed. 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. Students are responsible for attending class.

## 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.

## Disabilities

Students with disabilities will find numerous programs designated to coordinate academic accommodations and promote access to every phase of university life. Such programming is coordinated through Student Disability Services. SDS personnel oversee and coordinate programs to ensure accessibility on an individual basis to students with disabilities. Texas Tech strives to provide all students equal access to a college education and support in adjusting to the college experience. Prospective and current students interested in receiving more information regarding programs for students with disabilities should contact Student Disability Services, 335 West Hall, 806.742.2405 or visit online at [www.studentaffairs.ttu.edu/sds](http://www.studentaffairs.ttu.edu/sds). Email: [sds@ttu.edu](mailto:sds@ttu.edu)

## Grading

The grades used, including plus and minus, with their interpretations, are A, excellent; B, good; C, average; D, inferior (passing, but not necessarily satisfying degree requirements); F, failure; I, incomplete; and W, withdrawal (not to be confused with a drop). The letter R designates a course repeated to remove an I. The grade of 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. The studio 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. As per University policy, all work submitted to the professor becomes the property of the University.

## Reporting Illness and Deaths

In case of an illness that will require absence from class for more than one week, the student should notify his or her academic dean. The dean's office will inform the student's instructors through the departmental office. In case of class absences because of a brief illness, the student should inform the instructor directly. Other information related to illness can be found in the Student Handbook. The Center for Campus Life is responsible for notifying the campus community of student illnesses, immediate family deaths and/or student death.

## Discrimination, Harassment, and Sexual Violence

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 <http://www.depts.ttu.edu/titleix/>

## LGBTQIA Support Statement

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. Office of LGBTQIA, Student Union Building Room 201, [www.lgbtqia.ttu.edu](http://www.lgbtqia.ttu.edu), 806.742.5433

## 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 possible to make necessary arrangements. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806-742-2405

## TTU Statement of Ethical Principles

Texas Tech University is committed to the values of mutual respect; cooperation and communication; creativity and innovation; community service and leadership; pursuit of excellence; public accountability; and diversity. <http://www.depts.ttu.edu/officialpublications/catalog/EthicalPrinciples.php>

## Retention of Work

The college of Architecture reserves the right to retain, exhibit, and reproduce work submitted by students. Work submitted for grade is the property of the college and remains as such until it is returned to the students.