

**Instructor:** Robert Stepnoski, Senior Lecturer, RP [rob@austin.utexas.edu](mailto:rob@austin.utexas.edu)  
UT School of Architecture  
Office Hours: Virtual Monday – Friday 10-4



Selection of Historic Landmarks

## **description ARC F380C (70404) ARC F328R (70388) LAR F381R (70673)**

This class instructs students on the technologies of Reality Capture, understanding 3D Point Clouds, and their application to Architecture. Students will study Digital Heritage Preservation of Historic Landmarks in Austin with multiple technologies (LiDAR / Photogrammetry) and create computer models of the environment. The class will contrast the technologies to help students understand when and how to use them for architectural projects. Students will immerse in understanding the Art of The Point Cloud and learn presentation technique with Point Cloud Datasets.

## **learning objectives**

Insight on how to deploy 3D Laser Scanning technologies in the field  
Discuss the Theory and Science of Photogrammetry  
Process photogrammetric models to visualize and analyze 3D Point Clouds  
Insight on how to capture a site with UAVs (drones) flight for photogrammetry  
Learn methods for UAV driven aerial photogrammetry and documentation  
Discuss implementing scanning and photogrammetric methods is used in contemporary professional practice  
Enable students to select the best data capture technique for any given research scenario

## **skills to be explored**

Demonstrate competence in using point clouds from LiDAR and Photogrammetry.  
Understand how to use reality capture systems to create fast/accurate computer models of existing structures  
Be able to select the proper technology to suit a project's needs.  
Gain understanding of how to use a computer model to better understand a historic structure.

## **meetings & time commitment**

The class meets virtually Tuesdays and Thursdays from 12:15pm – 4:00 pm. Virtual office hours are 10-4 Mon-Fri, and workshop help can be arranged as needed. It is expected that a minimum of 4 - 6 hours outside of the regularly scheduled class meeting time will be necessary to prepare and complete the assignments.

### **• Module 1: Welcome (Week 1: Thursday June 4)**

- *Module 1, Session 1.0:* Synchronous Lecture: Course Introduction & Overview
- *Module 1, Session 1.1:* Historic Site Point Clouds Around Austin
  - Student Hardware/Software check.
  - Pix4D Student License Distribution
  - Is Pix4D, Recap, 3DS Max, Revit working?
  - Have you made a successful connection to the UT VPN?
  - Are you able to access the Course Share?
- *Discussion:*
- *Feedback:*
  - *Module 1, Assignment 1.0:* Reading – Digital Heritage Preservation
  - *Module 1, Assignment 1.2:* Field Work – Site Search

- **Module 2 (Week 2: Tuesday June 9): Digital Heritage Preservation**
  - Discuss Module 1 Assignments: Concerns, Q/A
  - *Module 2, Session 2.0: Synchronous Lecture: Digital Heritage Preservation*
  - *Narrated Lecture: A Brief Photogrammetry History*
    - *Module 2, Exercise 2.0: Pix4D – First Look Overview*
    - *Module 2, Exercise 2.1: Pix4D – Getting Started*
    - *Module 2, Exercise 2.2: Pix4D – Georeferencing*
    - *Module 2, Exercise 2.3: Pix4D – Measurements*
    - *Module 2, Exercise 2.4: Pix4D – Tie Points*
    - *Module 2, Exercise 2.5: Pix4D – Reducing Processing Time*
  - *Discussion:*
  - *Feedback:*
  - *Module 2, Assignment 2.1: Reading – Point Cloud Preservation Plans*
    - *Continue your course project site search*
- **Module 3 (Week 2: Thursday June 11): Photogrammetry (Aerial & Terrestrial)**
  - Discuss Module 2 Assignments: Concerns, Q/A
  - *Module 3, Session 3.1: Synchronous Lecture: Photogrammetry (Aerial & Terrestrial)*
  - *Module 3, Session 3.2: Reality Capture Workshop Session Part 1 of 2*
    - *Module 3 Exercise 3.0: Pix4D – Further Look Overview*
    - *Module 3, Exercise 3.1: Pix4D – Point Cloud Project Merge*
    - *Module 3, Exercise 3.2: Pix4D – Mosaic Editor*
    - *Module 3, Exercise 3.3: Pix4D – Animating Your Project*
    - *Module 3, Exercise 3.4: Pix4D – DSM, DTM, Contour Lines*
    - *Module 3, Exercise 3.5: Pix4D – Editing The 3D Point Cloud*
  - *Discussion:*
  - *Feedback:*
    - *Module 3, Assignment 3.0: Video Collection Basics*
    - *Module 3, Assignment 3.1: Field Work - Toe In Water*
- **Module 4 (Week 3: Tuesday June 16): Further Photogrammetry (Aerial & Terrestrial)**
  - Discuss Module 3 Assignments: Concerns, Q/A
  - *Module 4, Session 4.1: Synchronous Lecture: Further Photogrammetry (Aerial & Terrestrial)*
  - *Module 4, Session 4.2: Reality Capture Workshop Session Part 2 of 2*
  - *Module 4, Exercise 1.1: Aerial Photogrammetry Demo*
  - *Discussion:*
  - *Feedback:*
    - *Module 4, Assignment 4.0: Reading – Classifying Buildings from Point Clouds and Images*
    - *Module 4, Assignment 4.1: Processing – Classify a 3D Point Cloud Dataset*
- **Module 5 (Week 3: Thursday June 18): 3D Laser Scanning LiDAR**
  - Discuss Module 4 Assignments: Concerns, Q/A
  - *Module 5, Session 5.0: 3D Laser Scanning LiDAR Basics*
  - *Module 5, Session 5.1: Synchronous Guest Lecture: Larry Kleinkemper, AIA*
    - *Module 5, Exercise 5.1: Recap - 3D Laser Scanning LiDAR First Look Overview*
    - *Module 5, Exercise 5.2: Recap 3D Laser Scanning LiDAR*
    - *Module 5, Exercise 5.3: Recap 3D Point Cloud Import*
    - *Module 5, Exercise 5.4: Video: 3D Scanning Demo*

- - *Discussion:*
  - *Feedback:*
    - *Module 5, Assignment 5.0: Field Work - Now That Your Feet Are Wet*
- **Module 6 (Week 4: Tuesday June 23): Understanding 3D Point Clouds in Practice**
  - Discuss Module 5 Assignments: Concerns, Q/A
  - *Module 6, Session 6.0: Synchronous Lecture: Understanding 3D Point Clouds in Practice*
    - *Module 6, Exercise 6.0: 3DS Max - 3D Point Cloud Import*
    - *Module 6, Exercise 6.1: Revit – 3D Point Cloud Import*
  - *Discussion:*
  - *Feedback:*
    - *Module 6, Assignment 6.0:*
- **Module 7 (Week 4: Thursday June 25): Combining 3D Laser Scanning LiDAR & Photogrammetry**
  - Discuss Module 6 Assignments: Concerns, Q/A
  - *Module 7, Session 7.0: Synchronous Lecture: Combining 3D Laser Scanning LiDAR & Photogrammetry*
  - *Discussion:*
  - *Feedback:*
    - *Module 7, Assignment 7.0: Field Work - The Deep End*
    - *Module 7 Assignment 7.1: Combining the point clouds*
- **Module 8 (Week 5: Tuesday June 30): The Art of the Point Cloud**
  - Discuss Module 7 Assignments: Concerns, Q/A
  - *Module 8 Session 8.0: Synchronous Lecture: The Art Of the Point Cloud*
  - *Discussion:*
  - *Feedback:*
    - *Module 8, Assignment 8.0: Building your own Point Cloud Art & Drawing*
- **Module 9 (Week 5: Thursday July 2): Presentation Techniques using Multimedia Video**
  - Discuss Module 8 Assignments: Concerns, Q/A
  - *Module 9 Session 9.0: Synchronous Lecture: Creating Multimedia Presentations with Point Cloud Datasets*
    - *Module 9, Exercise 9.0: Adobe Premiere / Resolve Lecture*
  - *Discussion:*
  - *Feedback:*
    - *Module 9, Assignment 9.0: Storyboard Video with Point Clouds. Gathering your datasets.*
- **Module 10 (Week 6: Tuesday July 7): Review Prep**
  - End Review Preparation: Students development of their datasets, findings, and interpretations.
- **End Review (Week 6: Thursday July 9): Review**
  - End Review: Student presentation of work, findings, and interpretations in multimedia video and slideshow format.

### required texts

Readings/Tutorials will be assigned at each Module.

### required hardware/software

Laptop or Desktop with sufficient resources to run the design software currently at the School of Architecture

<https://wikis.utexas.edu/display/SOAdigitech/Hardware+Recommendations+-+Design+Students>

**Software:**

- Pix4D <https://www.pix4d.com>
  - Pix4D has provided the class with free student licensing
- Autodesk Recap, Revit, 3DS Max, AutoCAD <https://www.autodesk.com/education/free-software/featured>
- Meshroom <https://alicevision.org/#meshroom>

**additional requirements (optional)**

Smartphone, camera, or DSLR to support the Terrestrial Photogrammetry capture portion of the course. Students are NOT asked to bring a UAV (drone) or 3D Scanner, this will be demonstrated, and datasets provided given the circumstances of this time.

**progress:**

Everyone is starting out at differing levels of proficiency therefore your grade will be based on relative progress.

**attendance:**

With the exception of faculty exemption or an excused absence, class attendance is mandatory. The minimum penalty for more than two [2] unexcused absences is a full letter drop in the final grade for the course. Students should contact the instructor prior to class if they expect to be absent or late.

Absences based on religious observances must be arranged fourteen [14] days in advance. Any work missed during that time must be turned in within one week [7 days] of the absence. A student who fails to complete missed work within the time allowed will be subject to the normal academic penalties.

Attendance is expected for all lectures, field trips, studio sessions, and discussions. If a class meeting has to be rescheduled, it will be done in a timely manner, with the intention of accommodating the majority of the course participants' schedules.

**grade percentage**

- *class participation* [25% of course grade]  
Each student is expected to participate actively in the discussion of the required readings each week. Occasional in-class opinion surveys will be given and the results discussed among seminar participants. Readings should be completed two days before class to allow time for reflection.
- *3D Laser Scanning Models* [15% of course grade]  
Intent. Method application. Resulting model from LiDAR.
- *Photogrammetry Models* [35% of course grade]  
Intent. Method application. Resulting model from photogrammetry.
- *Interpretation and comprehension for historic preservation.* [25% of course grade]  
Students will work to create a presentation of what they learned about their historic structures from the different technologies and to make recommendations about how to best preserve and develop the site.

**grade scale**

Final grades will be computed in accordance with School of Architecture and University Academic Policies as follows:

grade	work quality	performance level	points
A	excellent	project surpasses expectations in terms of inventiveness, appropriateness, verbal and visual ability, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class. Project is complete on all levels.	4.0

A-			3.67
B+			3.33
B	good	project is thorough, well researched, diligently pursued, and successfully completed. Student pursues ideas and suggestions presented in class and puts in effort to resolve required projects. Project is complete on all levels and demonstrates potential for excellence.	3.0
B-			2.67
C+			2.33
C	required	project meets the minimum requirements. Suggestions made in class are not pursued with dedication or rigor. Project is incomplete in one or more areas.	2.0
C-			1.67
D	poor	project is incomplete. Basic skills including graphic skills, model-making skills, verbal clarity or logic of presentation are not level-appropriate. Student does not demonstrate the required design skill and knowledge base.	1.0
D-			.67
F	unacceptable	project is unresolved. Minimum objectives are not met. Performance is not acceptable. Note that this grade will be assigned when you have excessive unexcused absences.	0.0
X	excused incomplete	issued only in the case of compelling, nonacademic circumstances beyond the student's control. Simply not completing work on time is an inadequate cause for assigning this evaluation. It may only be used after consultation with the Associate Deans' offices and with an agreement as to a new completion date. According to School of Architecture policy, studio work must be completed before the second week of the next design semester in which the student is enrolling.	

Any grade can be re-evaluated based on student concern. Subsequent evaluations can cause the grade to be reduced, remain unchanged, or increased. Grades can only be discussed on an individual basis, not as a comparison with other students' grades.

### reading and writing skills

As a seminar, this course is discussion and technology intensive. Students are expected to participate actively in all discussions. If you are not confident in your English language skills, it is recommended that you go to the University's International Office and meet with someone in ESL Services to discuss classes or workshops that can help you.

### academic integrity

Plagiarism or violations of academic integrity in any form will be handled according to measures as outlined by the *General Information* catalog and the University. All course related work submitted for evaluation is to be original and prepared without unauthorized assistance. Work that is supplemented from ideas not originating from the student should clearly cite the parent source.

Students who violate University rules on academic integrity are subject to disciplinary action, including the receipt of a

failing grade for the course, and possible dismissal from the University. Since such infractions harm the individual, all students, and the integrity of the University, policies on academic integrity will be strictly enforced.

### **accommodations**

Please notify your instructor of any adaptation you may require to accommodate a specific physical need. You will be requested to provide documentation to the Dean of Students' Office, in order that the most appropriate accommodations can be determined. Specialized services are available on campus through the Services for Students with Disabilities Office [512.471.6259 or 512.471.4641 <http://www.deanofstudents.utexas.edu/ssd/>].

### **university of texas honor code**

The core value of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honest, trust, fairness, and respect toward peers and community.

### **documented disability statement**

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 512-471-6259 (voice) or 512-232-2937 (video phone).

### **use of e-mail for official correspondence**

Email is recognized as an official mode of university correspondence; therefore, you are responsible for reading your email for university and course-related information and announcements. You are responsible to keep the university informed about changes to your e-mail address. You should check your e-mail regularly and frequently to stay current with university-related communications, some of which can be time critical. You can find UT Austin's policies and instructions for updating your e-mail address at <http://www.utexas.edu/its/policies/emailnotify.php>.

### **religious holidays**

By UT Austin policy, you must notify the instructor of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will have the opportunity to complete the missed work within a reasonable time after the absence.

### **behavior concerns advice line (bcal)**

If you are worried about someone who is acting differently, you may use the Behavior Concerns Advice Line to discuss by phone your concerns about another individual's behavior. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The University of Texas Police Department (UTPD). Call 512-232-5050 or visit <http://www.utexas.edu/safety/bcal>.

### **faculty contact information**

office location: Virtual  
office hours: Monday – Friday 10-4  
email: [rob@austin.utexas.edu](mailto:rob@austin.utexas.edu)

Office hours will be maintained at stated times, as well as by appointment, in order to discuss issues related to the schedule, evaluation, coursework, etc. Please do not hesitate to notify the instructor of impending schedule conflicts with other classes.