

ARCH 418 • Designing with Natural Forces

Units: 3.0

Term: Spring 2020 (20201)

Location: HAR 115A

Time: Tuesday — 6:00 PM to 8:50 PM

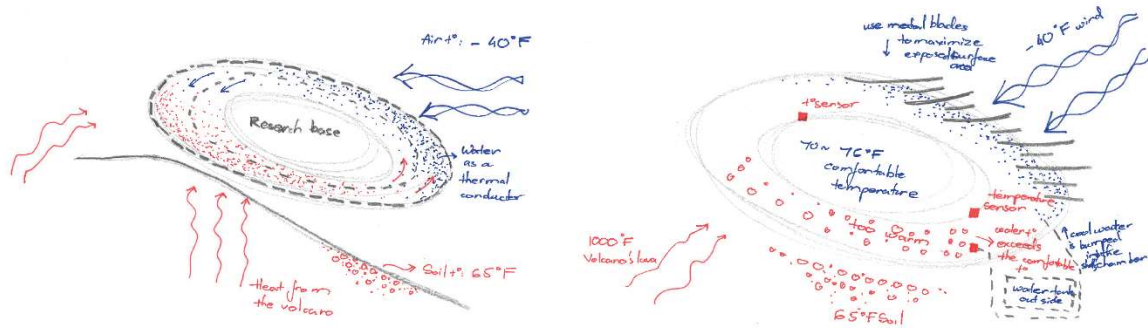
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Replies within 2 business days M–F



Final project sketches by Ahn Vo, Spring 2018

Course Description

Investigation of natural force effects and their relationships to architecture; laboratory work includes drawing, photography, model building, and tests on models.

A look at the past, present, and (possible) future of buildings that respond to natural forces. Lecture and discussion classes will examine the history of designing with natural forces with an eye to adapting these techniques into current and future work. The semester project will apply the concepts discussed in class to a hypothetical construction in a location with extreme natural forces. Students will leave the class with a practical understanding of natural forces, as well as their impact on the design process and the built environment at large.

Learning Objectives

- Understand connections between different natural forces.
- Develop computer analyses of natural forces on buildings.
- Explore alternative design options to address natural forces.
- Synthesize effects of multiple natural forces within design process.

Prerequisite(s): None.

Co-Requisite(s): None.

Concurrent Enrollment: None.

Recommended Preparation: Studio-level architectural drafting skills; manual drafting acceptable but computer aided (specifically Autodesk Revit Architecture) will be helpful. Ability to use Microsoft Office PowerPoint templates or convert them to another common presentation application. Ability to use Adobe Photoshop or InDesign templates, or convert them to another common graphics/page layout application. Rudimentary physical model building skills. General familiarity with materials and methods of construction.

Recommended Resources: Access to a computer capable of running Revit 2017 or newer and with the ability to download and install Autodesk CFD Ultimate and Autodesk Insight 360 plugin for Revit. Model-making supplies including but not limited to a craft knife (X-acto, etc.), a steel ruler or straightedge, and raw materials as needed.

Readings and Supplementary Materials

To be announced as needed. See Course Schedule for preliminary list of readings and resources.

Grading Breakdown

Students will be graded on an overall 200-point scale as follows.

Scored Items	Number	Total Points	Rubric	% of Grade
Assignments	5	50	Assignment	25.0%
Final Project	1	50	Project	25.0%
Attendance	15	13*	(1 pt per session*)	6.5%
Participation	15	26*	(2 pt per session*)	13.0%
Pop Quizzes	1 to 4	31	N/A	15.5%
Final Quiz	1	30	N/A	15.0%
		200		100.0%

* Per USC School of Architecture policy, students may miss two class sessions without a reduction in grade.

Description and Assessment of Assignments and Final Project

The deliverable for each assignment will be a slide deck, presented in-person to the class, with native and PDF versions submitted for grading. The Final Project also requires a presentation board.

ASSIGNMENT #1: EARTH

How can we defy gravity? Each student will research an alternative to the “traditional” load-bearing structural systems (post-and-beam, bearing wall, light framing).

ASSIGNMENT #2: AIR

What building features are beneficial or detrimental to wind resistance? Each student will explore wind forces generated by different building massing forms.

ASSIGNMENT #3: FIRE

Shine a light on daylighting! Each student will analyze relative effectiveness of various daylighting strategies using digital simulations and physical models.

ASSIGNMENT #4: WATER

Water goes down the hole... Each student will design two roof drainage options for a given roof layout.

ASSIGNMENT #5: CASE STUDY

Research! As a lead-in to the Final Project assignment, each student will research in-depth a building (or other structure intended for human use) located in an “extreme” environment, and which exhibits a particularly interesting response to one or more natural forces.

ASSIGNMENT #6: FINAL PROJECT

What has become clear to us? Building upon the natural forces explored in the first part of the semester, as well as ideas inspired by the Case Study assignments, each student will schematically design a research station located in an environment subject to extreme natural forces. Each student will document their design with a graphically compelling, competition-style board that explains the natural forces present in the extreme environment and how their research station design responds to those forces.

Grading Criteria

Assignments and other graded content are assigned grades based on multiple criteria. A given collection of criteria forms a rubric (see below). Each grading criterion is specifically defined as follows.

- **Formatting:** Following prescribed graphic/aesthetic format and/or the ability to achieve consistency in graphic/aesthetic format (with or without specific instructions). Effective implementation of spelling, grammar, and related text formatting and orthographic standards.
 - *Did you follow the instructions? Did you communicate clearly?*
- **Organization:** The underlying structure, order, or “flow” of material being presented.
 - *Did your presentation make sense as it was presented?*
- **Deliverables:** Completeness and relevance of items assigned to be provided. Technical proficiency in the correct application of subject matter relative to the assignment, including but not limited to written calculations and detail drawings.
 - *Did you understand the assignment? Did you produce what was requested? Is it correct?*
- **Class Presentation:** Effectiveness of presentation based on professional appearance, poise and delivery of content, engagement with audience, and overall technique (including pacing and adherence to time limits).
 - *Did you clearly explain your work?*
- **Overall Impression:** Discretionary rating of your performance relative to the performance of other students and the opinion of the instructor.
 - *Did you meet or exceed expectations?*

For each criterion, the points earned will place that criterion into one of three levels of achievement, as follows. Note that “threshold” points, those at the quartile divisions, will be assigned to the higher or lower of the two possible levels of achievement at the discretion of the instructor.

- **Novice:** Student has not demonstrated understanding or mastery of the criteria. Individual criterion score is in lowest two quartiles of possible points.
- **Competent:** Student has demonstrated understanding of the criteria but not mastery. Individual criterion score is in the second highest quartile of possible points. Note that competency (understanding) is acceptable for some criteria, but proficiency (mastery) is the desired result.
- **Proficient:** Student has demonstrated both understanding and mastery of the criteria. Individual criterion score is in the highest quartile of possible points.

Grading Rubrics

ASSIGNMENT RUBRIC (10 POINTS)

This rubric is used for all assignments except the final project. Maximum score is 10 points.

Criteria	Levels of Achievement			% of Total
	Novice	Competent	Proficient	
Formatting	0.0 to 0.5	0.5 to 0.75	0.75 to 1.0	10.00%
Organization	0.0 to 0.5	0.5 to 0.75	0.75 to 1.0	10.00%
Deliverables	0.0 to 2.0	2.0 to 3.0	3.0 to 4.0	40.00%
Class Presentation	0.0 to 1.0	1.0 to 1.5	1.5 to 2.0	20.00%
Overall Impression	0.0 to 1.0	1.0 to 1.5	1.5 to 2.0	20.00%

PROJECT RUBRIC (50 POINTS)

This rubric is used for the comprehensive final project (Assignment #6) that is presented at the Final Exam session. Maximum score is 50 points.

Criteria	Levels of Achievement			% of Total
	Novice	Competent	Proficient	
Formatting	0.0 to 2.0	2.0 to 3.0	3.0 to 4.0	8.00%
Organization	0.0 to 2.0	2.0 to 3.0	3.0 to 4.0	8.00%
Deliverables	0.0 to 12.0	12.0 to 18.0	18.0 to 24.0	48.00%
Class Presentation	0.0 to 5.0	5.0 to 7.5	7.5 to 10.0	20.00%
Overall Impression	0.0 to 4.0	4.0 to 6.0	6.0 to 8.0	16.00%

Assignment Submission Policies

DUE DATE AND TIME

Assignments are due on the date indicated herein or the date indicated in the USC Blackboard system, whichever is later. Unless otherwise noted, an electronic version of an assignment must be uploaded to the appropriate assignment in the USC Blackboard system by 5:00 PM (USC local time) on the date due. (Yes, this is one hour before the start of class.) Most assignments will be reviewed during class time in the form of a presentation by each student to the other students in the class.

LATE ASSIGNMENTS

If a student is unable to attend the class to present an assignment, then a digital copy of the student's assignment will be accepted if received via email no later than 5:00 PM (USC local time) on the day it is due. Assignments received after 5:00 PM (USC local time) will be graded down by one (1) point for each hour or portion of an hour after 5:00 PM that expires before the assignment is received. Note that even though assignments may be accepted and graded, students who are not present will not receive participation points for the class or points for the Class Presentation criterion of the Assignment Rubric.

CITATION STYLE

There is no prescribed citation style, though the instructor suggests use of the Chicago Manual of Style, which is freely available online at <https://www.chicagomanualofstyle.org/>. USC Libraries offers a min-site for the APA Style at <https://libguides.usc.edu/APA-citation-style>. What is most important about citations is to be *consistent* within the content of an assignment and throughout all assignments over the course of the entire semester. Do not mix citation styles! Do not omit citations!

ASSIGNMENT FORMAT

Most assignments will be in the form of "slide deck" or "slideshow" presentations given during a portion of class time, typically using Microsoft PowerPoint. Presentations should be refined to be about 5 minutes in length, and not more than 10 minutes in length (not including questions and discussion). In general, assignments will be submitted in two formats: Portable Document Format (PDF) and the native format of the presentation (e.g., PowerPoint .pptx).

Prescribed formats typically include the USC School of Architecture logo in recognition of this course being part of that school. You are free to supplement the prescribed formats with additional logos and University units, provided that the use of all logos conforms to the USC Identity Guidelines for the University and its sub-units at <https://identity.usc.edu/>.

Written assignments such as research papers should have body text set in 11-point Times or Times New Roman with 14-point line spacing (leading) and 1-inch margins all around, or as otherwise specified by the instructor. Text in drawings should be ALL-CAPS set in an appropriate sans-serif font face (such as Roboto Condensed, Arial Narrow, or Helvetica Condensed) and may be smaller than typical written assignments, but no smaller than 3/32" (approximately 6.75 points) in height.

DIGITAL FILE NAMES

All electronic submissions, whether assignments or make-up work, must be provided as digital files no larger than 16 MB. Larger files can be broken down into smaller files (each under 16 MB) and labeled accordingly (see “1of2” below). Each submitted digital file should be labeled as follows:

Name_ARCH418_A#_1of2.pdf

- “Name” is the student’s last name -or- USC username — followed by an underscore (_)
- “ARCH418” is the course code — followed by an underscore (_)
- “A” is for “assignment” — change to “M” for make-up work, “E” for extra credit
- “#” is the relevant assignment number — one assignment per file please!
- “1of2” is only used with larger files — identify each part “of” the total number of parts
- “.pdf” is the standard file extension for PDFs — change this as needed for native formats

As an example, if a student named Bob Smith is submitting a single digital file containing the PDF for Assignment #4, then the file name would be *Smith_ARCH418_A4.pdf*.

Quizzes

Each student will have the opportunity to demonstrate their knowledge through one to four unannounced closed-book quizzes that cover content from the immediately preceding lecture slides and readings. In addition, each student must complete one final, timed, open-book quiz that covers content from the entire semester, to be assigned at the final regular class session and due before the start of the final exam session.

Extra Credit

Extra credit assignments may be made available in select circumstances, and only at instructor discretion. There is no guarantee of extra credit assignments during the semester. Do your work!

Grading Scale

Course final grades will be determined using the following scale.

Letter Grade	Total Points		Percentages		GPA
	Low	High	Low	High	
A	≥ 185	≤ 200	92.50%	100.0%	4.00
A–	≥ 180	< 185	90.00%	92.49%	3.67
B+	≥ 175	< 180	87.50%	89.99%	3.33
B	≥ 165	< 175	82.50%	87.49%	3.00
B–	≥ 160	< 165	80.00%	82.49%	2.67
C+	≥ 155	< 160	77.50%	79.99%	2.33
C	≥ 145	< 155	72.50%	77.49%	2.00
C–	≥ 140	< 145	70.00%	72.49%	1.67
D+	≥ 135	< 140	67.50%	69.99%	1.33
D	≥ 125	< 135	62.50%	67.49%	1.00
D–	≥ 120	< 125	60.00%	62.49%	0.67
F	≥ 0	< 120	0.00%	59.99%	0.00

Attendance Expectations

Attending classes is a basic responsibility of every USC student who is enrolled in courses at the School of Architecture. The School of Architecture believes important skills such as verbal presentation, design discussion and articulation of critical issues within each course are additional measures of demonstrated knowledge equal to traditional quizzes, exams, and design projects. Regular and punctual class attendance is considered an essential part of satisfying accreditation requirements for the School of Architecture.

Each student is expected to attend every scheduled class. Exceptions will be made for personal religious observances per University policies. Exceptions will also be made for personal illness, family emergencies and similar unforeseen conditions, or for a pre-approved academic reason (such as a conflict with another class), if written documentation is provided within two (2) weeks following the unforeseen condition or academic reason. Other exceptions may apply in accordance with University policies.

The School of Architecture's general attendance policy is to allow a student to miss the equivalent of one week of class sessions — that is, one (1) class for ARCH 418 — without directly affecting the student's grade and ability to complete the course. A second absence is allowed by instructor discretion. (This is reflected in the grading breakdown for the semester.) If additional absences are required for a personal illness, family emergency, pre-approved academic reason, or religious observance, the situation should be discussed and evaluated with the instructor and appropriate Department Chair on a case-by-case basis. Per School of Architecture policy, a student's letter grade can be lowered up to one full letter grade for each absence beyond the allowed number (i.e., more than two).

A student who misses a class beyond the limits noted herein will not receive participation credit for the missed class or credit for the assignment presentation. A student who misses more than the allowed number of classes (i.e., more than two) without submitting make-up work or making other arrangements with the instructor may have their letter grade for the course lowered up to one full letter grade for each absence beyond the allowed number.

Lectures and presentations will begin at the class start time. Any student not in class within the first five (5) minutes is considered tardy and will lose one-half of an attendance/participation point for the session for each five-minute period they are late. After 30 minutes, the student will be considered fully absent for the entire class session. In addition, any student not actively present (in any form including sleep, technological distraction, or by leaving during class for an unscheduled restroom or water break) for more than ten (10) minutes of class time, or other length of time deemed unreasonable at the sole discretion of the instructor, can be considered fully absent for the entire class session. If arriving late, a student must be respectful of the class in session and do everything possible to minimize the disruption caused by their late arrival.

Critical Dates and Religious Observances

The University recognizes the diversity of our community and the potential for conflicts involving academic activities and personal religious observation. The University provides a guide to such observances for reference and suggests that any concerns about lack of attendance or inability to participate fully in the course activity be fully aired at the start of the term. As a general principle, a student will be excused from class for these events if properly documented and if provisions can be made to accommodate the absence and make up the lost work.

Constraints on participation that conflict with adequate participation in the course and cannot be resolved to the satisfaction of the instructor and the student need to be identified prior to the drop/add date for registration. After the drop/add date, the University and the School of Architecture shall be the sole arbiter of what constitutes appropriate attendance and participation in a given course.

Please advise the instructor if you will miss the classes due to religious observances on holy days. Should you have any questions or concerns about University policy on this subject, please contact the Office of Religious Life or the Office of Equity and Diversity. A listing of holy days and occasions also appears on the Office of Religious website, which is at <http://orl.usc.edu/>.

Make-up Work for Missed Classes

It is *always* the student's responsibility to seek means to make up work missed due to absences, *never* the instructor's. However, such recourse is not always an option due to the nature of the material covered during the missed class or classes. Determination of appropriateness of make-up work for missed classes is at the discretion of the instructor.

Use of Technology in the Classroom

Hands-on use of certain types of personal technology devices, specifically laptops or personal computers, is encouraged. However, please be courteous to other students and the instructor by not using other types of personal technology devices (such as smartphones or music players) during class time. Personal technology devices of any type, including laptops or personal computers, should be set to "silent" or "vibrate" mode so as to minimize audible disruption of the class.

If a student must make or take a mobile telephone call, send or receive a text, or similar disruptive activity, the student should quietly step outside of the classroom space and do so. Frequent or disruptive use of personal technology devices may be reflected in a student's participation score for the session.

Disruptive Behavior

Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class (pending discussion and resolution of the problem) and may be reported to the Office of Student Judicial Affairs for disciplinary action.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards"

<https://policy.usc.edu/scampus-part-b/>.

Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

STUDENT COUNSELING SERVICES (SCS) – (213) 740-7711 – 24/7 ON CALL

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

NATIONAL SUICIDE PREVENTION LIFELINE – 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

RELATIONSHIP AND SEXUAL VIOLENCE PREVENTION SERVICES (RSVP) – (213) 740-4900 – 24/7 ON CALL

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

SEXUAL ASSAULT RESOURCE CENTER

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

OFFICE OF EQUITY AND DIVERSITY (OED)/TITLE IX COMPLIANCE – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class.

<https://equity.usc.edu/>

BIAS ASSESSMENT RESPONSE AND SUPPORT

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

THE OFFICE OF DISABILITY SERVICES AND PROGRAMS

Provides certification for students with disabilities and helps arrange relevant accommodations.

<http://dsp.usc.edu>

STUDENT SUPPORT AND ADVOCACY – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

DIVERSITY AT USC

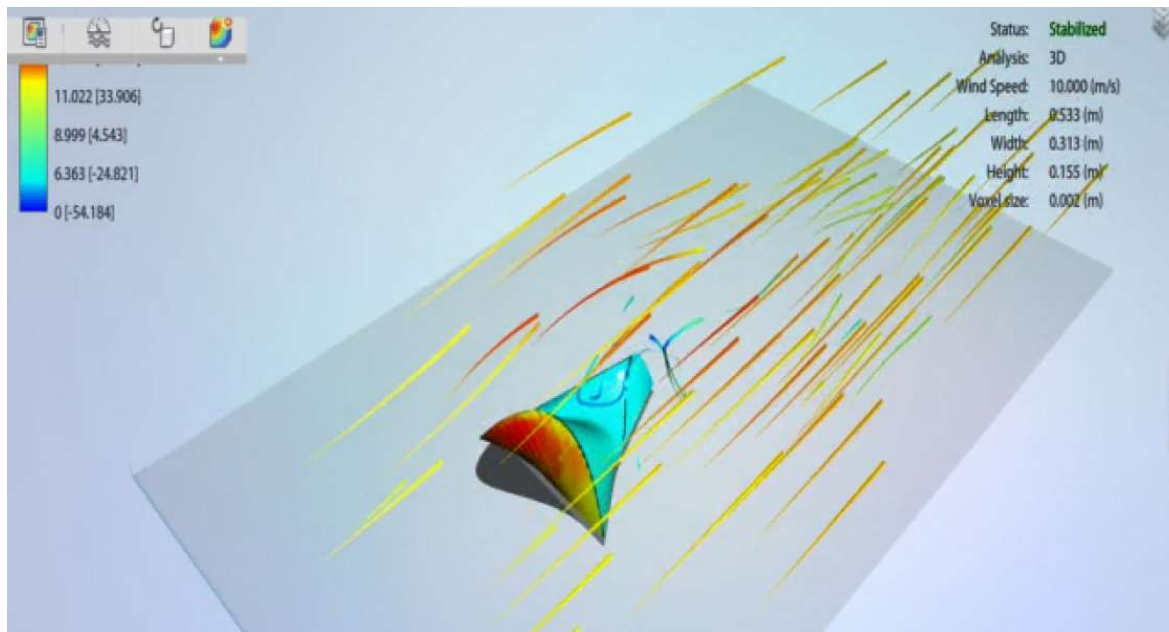
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

USC EMERGENCY INFORMATION

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

USC DEPARTMENT OF PUBLIC SAFETY – 213-740-4321 (UPC) AND 323-442-1000 (HSC) FOR 24-HOUR EMERGENCY ASSISTANCE OR TO REPORT A CRIME.

Provides overall safety to USC community. <http://dps.usc.edu>

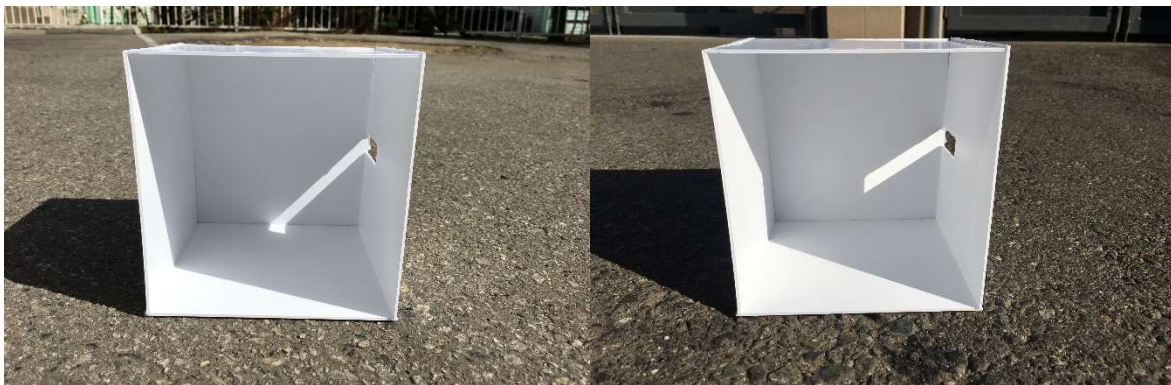


Assignment #2 airflow analysis by Alexia Avanesian, Spring 2018

Course Schedule: A DAILY BREAKDOWN**(revised 1/13/20)**

	Topics/Daily Activities	Readings/Resources	Assignments & Due Dates
Session 1 (1/14)	Welcome & Introductions Lecture: Introduction/ Overview	• An Insight into Green/ Ecological Architecture and Natural Building • Working With Not Against Natural Forces • Building With Nature (Guidelines & Brochure) • Forces for Architecture	Assignment #1: Earth (due 1/28)
Session 2 (1/21)	Lecture: Structural Systems Discussion/Exercises	• Basic Structural Systems in Architecture	
Session 3 (1/28)	Review Assignment #1: Earth Lecture: Wind Design	• Video: Wind Load Calculation • Video: Basic Urban Wind Effects • Video: Overview of Autodesk Simulation CFD for Architecture	Assignment #2: Air (due 2/11)
Session 4 (2/4)	Lecture: Acoustics Discussion/Exercises	• Understanding Acoustics in Architectural Design • 10 Buildings with Extraordinary Acoustics	
Session 5 (2/11)	Review Assignment #2: Air Lecture: Daylighting	• Daylighting (WBDG) • Daylighting Analysis in BIM • The Physics of Color Temperature	Assignment #3: Fire (due 2/25)
Session 6 (2/18)	Discussion/Exercises	• TBA	
Session 7 (2/25)	Review Assignment #3: Fire Lecture: Design for Water	• TBA	Assignment #4: Water (due 3/10)
Session 8 (3/3)	Discussion/Exercises	• TBA	
Session 9 (3/10)	Review Assignment #4: Water Lecture: Extreme Environments	• Designing for Extreme Environments (#1 & #2) • Habitation in Extreme Environments	Assignment #5: Case Study (due 3/31)
RECESS (3/17)	NO CLASS (ENJOY SPRING BREAK)		
Session 10 (3/24)	Discussion/Exercises	• TBA	

Session 11 (3/31)	Review Assignment #5: Case Study Lecture: Final Project	• Habitation in Extreme Environments • ArchDaily Research Center • Mars Analogue Research Station (MARS) Program	Assignment #6: Final Project (due 4/30 and 5/12)
Session 12 (4/7)	Lecture: Site Analysis Discussion/Exercises	• Design-Tech (excerpt) • Architectural Site Analysis Guide • Climate & Site Analysis • Site Analysis Examples	
Session 13 (4/14)	Lecture: Presentations Discussion/Exercises	• ACSA Competition Archives • Architecture Presentation Board Tips • Presentation Board Layout Tips • Portfolios and Presentations in InDesign	
Session 14 (4/21)	Discussion/Exercises	• TBA	
Session 15 (4/28)	Discussion/Exercises	• N/A	Final Quiz (due 5/12)
FINAL (5/12) 7–9 PM	Review Assignment #6 (Presentations) Review Final Quiz	• N/A	Course Review



Assignment #3 daylighting analysis by Brandon Bruscato, Spring 2018