USC School of Architecture

Semester	Fall 2022
Time	Tuesday & Thursday 9:30AM - 10:50AM
Location	Harris Hall - 101
Instructor	**Anthony** Brower, AIA, LEED Fellow (abrower@usc.edu) Global Climate Action & Sustainability Practice Area Leader @ **Gensler**
TA's	Najiyya Nadir Siddiqui (najiyyan@usc.edu) Shreya Satodia (satodia@usc.edu) Aditya Bahl (aabahl@usc.edu)
Office Hours	Monday – Friday 11:30-12:30 by availability and appointment only https://calendly.com/anthonybrower/usc-office-hours

Our Opportunity and Responsibility as Architects

Fueled by population growth, within the next twenty years the global built environment will be redesigned, added to, or remade, adding an area equal to 3.5 times the existing buildings of the United States (900 billion square feet) (ARCH 2030). In the process, energy patterns will be locked in for our cities and for our planet for the following 50 years. If Climate Change is to be manageable and not catastrophic, future development must be defined by an awareness of and a commitment to high performance, deep energy efficiency, and even carbon neutral design.

During the past century, the architectural profession has moved, by and large, away from a century's old awareness of the environment, a deeper understanding of local climates, and a knowledge of how to maintain balance between building and environment. As a result, deeper dependencies on mechanized heating and cooling, especially when buildings were designed with ingrained inefficiencies, became the norm and the solution to any problem. Energy use in buildings skyrocketed as a result, fueling the need for more power plants to supply energy for inefficient buildings and cities. For generations, this energy has been provided, by and large, by fossil fuel fired power plants, leading to increased CO2 emissions. Recently, there has been a professional awakening around the role architects play in contributing to the problem of climate change. In the October 2003 edition of Metropolis, Ed Mazria called out the profession pointing out that, "Architects Pollute". In the immediate aftermath, the American Institute of Architects (AIA) brought focus to energy efficiency and sustainability - both of which are now core doctrines for the AIA.

Architects see problems and solve problems. This is critically important when it comes to energy dependence and climate change. We are living through a time when the profession is in transition. Designing without understanding the impacts for energy, water and resource consumption is no longer possible. State and National Energy Codes now place limits on the amount of energy that can be used by buildings. This is a time of great challenge for architects (and future architects). It is also a time of great opportunity.

Course Description

This course will discuss Climate Change and the critical role architects play in the discussion in the context of understanding and designing for the thermal environment of buildings. Through the semester, students will discuss and review basic concepts of sustainability, gaining an understanding of climate appropriate design, passive heating and cooling, and renewable energy systems. At the same time, through weekly readings and exercises, students will use tools to help them understand, measure, and design better buildings. They will be exposed to and will learn the international language of sustainability.

During the semester, students will explore concepts and test ideas that should be used to drive building design in current and future design studios. Utilizing passive energy features, understanding daylighting, and other concepts that, when combined, lead to the design of Zero Net Energy Buildings.

Required Textbook

Heating, Cooling, Lighting: Sustainable Design Methods for Architects
By Norbert M. Lechner, 4th Edition, ISBN: 978-1118582428, 720 pages, 2014
https://uosc.primo.exlibrisgroup.com/discovery/fulldisplay?context=PC&vid=01USC_INST:01USC&search_scope=MyInst_and_CI&tab=Everything&docid=cdi_askewsholts_vlebooks_9781118849453

Recommended Textbooks

Carbon-Neutral Architectural Design (Pablo LaRoche) - Available at the Bookstore, E-Book Available from:
https://uosc.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_informaworld_taylorfrancisbooks_9781315119649&context=PC&vid=01USC_INST:01USC&lang=en&search_scope=MyInst_and_CI&adaptor=Primo%20Central&tab=Everything&mode=Basic

Catalog Description

A one semester course focused on climate awareness and the impact that architects and architecture have on the planet. The course will cover human comfort, climate analysis, passive and active systems, heating and cooling, energy analysis, and water reuse.

This course will be focused on translating basic physics concepts into usable and understandable design strategies that you will utilize to give buildings form.

This course, with a special emphasis on climate awareness, energy efficiency, and sustainable design, provides an understanding of the basic principles and appropriate application required for high performance building systems. Students will learn, incrementally, what it takes to design a highly energy efficient, carbon neutral building. Discussions and assignments will focus on climate analysis, climate appropriate design strategies; passive heating, cooling, ventilation cooling; mechanized electrical, mechanical, and plumbing of buildings; and renewable energy and water systems.

Learning Outcomes

Upon completion of this course, it is expected that students will be able to:

1. Perform architecturally focused Climate Analysis, including an evaluation of passive design strategies. Evaluate the impact and potential of solar radiation to both help and hinder high performance buildings. Understand how energy moves through the building envelope and how architectural features can manipulate and control this flow of energy.

2. Understand what design strategies are most appropriate for a specific climate and site. Understand how building envelope, solar shading, and passive energy features can minimize the dependence on mechanized energy systems (heating, cooling, lighting, and heating of hot water).

3. Analyze energy use in buildings to gauge the impact of design alternatives, design approaches, measuring the impact of each individually or in combination to first reduce building energy use, then move towards Zero Net Energy (ZNE), and finally arrive at Carbon Neutrality.

4. Develop and articulate a vocabulary founded in sustainability and focused on high performance energy efficiency and carbon neutral architecture. Create an awareness to building energy codes and high performance, sustainable building programs (California Energy Code, Cal-Green, LEED, and Living Building Challenge).

Course Schedule

Wk	Date	Ch	Topic	Exercise # & Due Date
1	8/23/22	P	Course Introduction & Design Inspiration How the Building Industry Can Respond to the IPCC Report	
	8/25/22	1 & 2	Form Givers & Energy	
2	8/30/22	3	Design Physics	ex1
	9/1/22			
3	9/6/22	4	Thermal Comfort	ex2
	9/8/22			
4	9/13/22	5	Climate & Site Analysis	ex3
	9/15/22			
5	9/20/22	6 & 7	Solar Geometry	ex4
	9/22/22			
6	9/27/22	9	Exterior Shading	POV1
	9/29/22		**Midterm Exam 1**	
7	10/4/22	15 & 3	Thermal Envelope Design	ex5
	10/6/22	Apx J		
8	10/11/22	13	Daylighting	ex6
	10/13/22	9	Fall recess – No class	
9	10/18/22	8	Renewable Energy Systems	ex7
	10/20/22			
10	10/25/22	10	Passive Cooling	POV2
	10/27/22			
11	11/1/22	16	Ventilation Systems (Chapter sections 16.17 through 16.22)	ex8
	11/3/17		**Midterm Exam 2**	
12	11/8/22	11	Site Design & Community Planning	ex9
	11/10/22			
13	11/15/22	16	Mechanical Systems (Chapter sections 16.1 through 16.16)	ex10
	11/17/22			
14	11/22/22	P	Special Topic - Guest Lecture	ex11
	11/24/22		Thanksgiving - No Class	
15	11/29/22	P	Codes & Standards	POV3
	12/1/22			
16	12/6/22		Study Day – No Class	
	12/8/22		**Final Exam**	
		^	*Chapters and publications (P) are to be read in advance of each noted class day* *There will be one pop quiz replacing a lecture in each of the above three class sections*	

Quizzes, Exams & Homework

There will be homework assigned throughout the semester. Material on quizzes, midterm exams, and the final exam will be heavily related to the homework, required textbook, and other assigned reading/publications. All exams will be open book but limited in time. This means that notes, previous exams, previous quizzes may not be brought into the exam. Possession of a previous exam, quiz or any webpage while taking an exam will disqualify the exam. Too many students have counted on these in the past, instead of doing the homework, and the result has been a drop in the average grades! (You are encouraged to study using these materials before the exams, but you may not bring them into the exam with you. If you find that you have such materials among your notes, you must immediately take them out and place them upside down on the floor in front of you, along with your phone/tablet and any other mobile devices, for the duration of the exam.)

Grading Breakdown

The grade for the semester will be based on the following percentages

30%	**Pop Quizzes** (3) 10% each
60%	**Exams** (3) 40% 2 Midterms (20% each) 20% 1 Final
10%	**Participation** 3% Weekly Exercises (Homework) 3% In-class Participation 4% Developing your unique Point of View

Participation

Exercises are issued in class and are due at the beginning of the following class. Exercises will not be graded or returned. Submitting the completed exercise will contribute to your participation grade. Note that submitting incomplete exercises will not contribute to your participation grade.

Exercise #1: Design Inspiration
Students will research significant architectural projects from the past 30-years, select one of their choosing whose design motivation is clearly defined by sustainability and explain how that sustainability move was the primary driver of the project's design.

Exercise #2: City Scale Thermodynamics
Utilizing what we discussed in class, students will identify ways that buildings can address global carbon emissions at the city scale.

Exercise #3: Psychrometrics
Students will demonstrate an effective understanding of how to use a Psychrormetric chart.

Exercise #4: Coastal Opportunity
Students will demonstrate an understanding of site climatic issues

POV Draft 1: 150-words
Students will look forward in time, also called futurecasting, to events that will be taking place at the end of the school year, or further. Consider how these events might negatively impacting the environment. Use that negative impact to work backwards to develop your point of view on how the design of buildings or cities can create a positive solution for this problem.

Exercise #5: Form Follows Sun
Students will draw a section diagram of a house that takes advantage of variable sun angles in across multiple seasonal conditions.

Exercise #6:
Understanding the different insulation and performance potential of various glazing systems

Exercise #7:
The impact of daylighting on interiors

POV Draft 2: 300-words
Building upon your initial idea developed for your initial POV draft 1, expand your narrative in one of several ways. 1) look for similarities in other industries that relates to your idea and apply the alternate industries solution to explore how it might solve the same problem for buildings. 2) invite someone to read you initial idea and poke holes in your theory. Then expand your narrative to address those challenges head-on.

Exercise #8:
Develop a whole building section that utilizes optimal photovoltaic angles to define building form

Exercise #9:
Explain how building materials impact indoor air quality

Exercise #10:
Explain how urban planning can positively impact a buildings heating and cooling demand.

Exercise #11:
Understanding mechanical room location strategy

POV Draft 3: 500-words
Building upon your expanded idea developed for POV draft 2, consider how your idea might scale. If you concept was at the city scale, how would it scale down to and apply to individual buildings, if it was a building scale concept, how might it scale up to cities? Now refer to your original futurecasting idea to frame the opening of your POV and also refer back to it in your closing statement of the narrative.

Teaching assistants will do their best to track **in-class participation**, answering questions, asking questions, participating in dialogue, etc. The point is to be present and engage. When you enter the professional industry, your clients will look to you for guidance and expertise, which you cannot do unless you actively engaged in, and often leading, dialogue.

Establishing a **Point of View** is critical for any practicing architect. You will be expected to take a position on one of the topics covered in class and develop a unique narrative on how this topic positively intersects with and can influence design. Impactful narratives also take current events into account. One or two students' final narratives will be selected to expand their topic further through a co-authored publication on Gensler's thought leadership blog on design after the conclusion of the course.

2010 Imperative Statement

The Architecture Faculty has voted to accept the 2010 Imperative-- to improvement of ecological literacy among the students and faculty and to achieve a carbon-neutral design school campus by 2010. To that end, this class will address issues of carbon neutrality and ***supports*** the following goal for all designs produced in the USC School of Architecture:

"The design should engage the environment in a way that dramatically reduces or eliminates the need for fossil fuel."

This does not mean that no other issues are to be addressed. Precisely to the contrary, all design issues are fair game, but in the background, all will be considered within the generalized goal of reducing or eliminating the need for fossil fuel.

Calculation Of Grade

Letter grades are converted to numeric values using the following values:

Letter	%	Definition *(Student learning and accomplishment…)*
A	93-100	… far exceeds published objectives for the course/test/assignment and student work is distinguished consistently by is high level of competency and/or innovation.
A-	90-92.99	
B+	87-89.99	… goes beyond what is expected in the published objectives for the course / test / assignment and student work is frequently characterized by its special depth of understanding, development, and/or innovative experimentation.
B	83-86.99	
B-	80-82.99	… meets all published objectives for the course/test/assignment and the student work demonstrates the expected level of understanding, and application of concepts introduced.
C+	76-79.99	
C	72-75.99	
C-	68-71.99	… based on the published objectives for the course/test/assignment were met with minimum passing achievement.
D+	64-67.99	
D	60-63.99	
F	< 60	… based on the published objectives for the course/test/assignment were not sufficiently addressed nor met.

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 students should 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 faculty 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.

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 Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. Violations of academic honesty (i.e. copying another student's work and submitting it as your own) will result in a grade of "0" for the assignment or quiz and may have other disciplinary consequences. Students who share their work with others will also receive a grade of "0". Quizzes and tests must be taken in class, even if the quiz or test is given online. Students who submit a quiz or test given online (through Blackboard or other means) and who are not in the classroom at the time the quiz or test is administered are violating

the principles of academic honesty. The test or quiz being taken will be graded as “0”. There may be other disciplinary consequences. All students are expected to understand and abide by these principles.

SCampus, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Professional Degree

The USC School of Architecture’s five-year BARCH degree is an accredited professional architectural degree program. All students can access and review the NAAB Conditions of Accreditation (including the Student Performance Criteria) on the NAAB Website, http://www.naab.org/accreditation/2004_Conditions.aspx.

Attendance

Attending classes is a basic responsibility of every USC student who is enrolled in courses at the School of Architecture. Regular and punctual class attendance is considered an essential part of satisfying the NAAB accreditation requirements therefore attendance will be taken at every class session. Students who are not in class at the time a quiz is given will not be given an opportunity to make up the test (without exception) and will be given a grade of “0” for the quiz. Students who take a test or quiz and do not remain for the duration of the lecture will have their quiz or test disqualified (and graded as “0”). Students who arrive late for class will not be given any extension of time to take a quiz or test; the quiz end time will be the same for all students. If arriving late, a student must be respectful of a class in session and do everything possible to minimize the disruption caused by a late arrival. It is always the student’s responsibility to seek means to make up work missed due to absences.

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” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

Students and Disability Accommodations

USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
osas.usc.edu
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.
USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
ombuds.usc.edu
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

*Occupational Therapy Faculty Practice - (323) 442-33*40 or otfp@med.usc.edu
chan.usc.edu/otfp
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.