School of Architecture | Georgia Tech | Fall 2026

ARCH 3231/6531: Environmental Systems and Design Integration I. 3 Credit Hours.

ARCH 3231/6531 Syllabus

ARCH 3231/6531: Environmental Systems and Design Integration I. 3 Credit Hours.

Fall 2026

Instructor Information

Instructor: Dr. Hugo Sheward

Email: hshewardga3@gatech.edu

Office Location: Architecture East 305B - Office hours

Office Hours: by appointment

TA Name: Tbd

TA Email: Tbd

General Course Information

Course Description

1. Bachelor of Science in Architecture (B. S. Arch.)
   ARCH 3231. Environmental Systems and Design Integration I

   Human physiology, the occupation of space, and principles of sustainability. Micro-climate, energy consumption, thermal loading, passive solar strategies, daylighting, optics, and acoustics.

2. Master of Architecture (M. Arch.)
   ARCH 6531. Environmental Systems I

   Basics of heat, light, and sound applied to buildings. Thermal loading, passive thermal control, thermal comfort, climate, passive solar strategies, light and daylighting, acoustics.

Course Overview

This course investigates how architecture can be designed by considering environmental conditions and human needs. Earth's climates and seasons, the physics of thermal energy, light, and sound, and our human desire to be comfortable and to enjoy architectural spaces lay the foundations for three main

topics: daylighting, thermal comfort, and architectural acoustics. Environmental Systems I focuses on how to employ passive architectural shapes, components, elements, and materials to work as systems that enhance thermal, visual, and acoustic comfort, before employing

Course Learning Outcomes

This course is designed to accomplish the following objectives:

1. Define architectural terms, principles and concepts of sustainable design, daylighting, and acoustics.
2. Explain critical thinking processes that improve architectural performance.
3. Demonstrate passive architectural systems to enhance thermal, visual, and aural comfort.

Learning Objectives

Note: For all M. Arch courses, see also "Professional Standards Addressed"

Those students who successfully complete the course will be able:

1. Illustrate the role architects have in the design of sustainable visual and thermal environments.
2. Apply principles of environmental systems for human needs to make informed architectural design decisions.
3. Evaluate existing and new spaces using rules-of-thumb and simulation for environmental performance.

Required Course Materials

Instead of designating one or a couple of textbooks as required, the course instructors assembled course readings and denoted them as weekly reading assignments. All readings will be posted to Canvas as PDF files or hyperlinks. The reader is composed from the following references:

- Lechner, N. (2014). Heating, cooling, lighting: Sustainable design methods for architects. John Wiley & Sons.
    - R1: Chapter 1: Heating, Cooling, and Lighting as Form-Givers in Architecture
    - R2: Chapter 5: Climate
    - R5: Chapter 4: Thermal Comfort
- Reinhart, C. (2014). Daylighting Handbook I and II.
    - R3: Chapter 2: Designing for Daylight
    - R4: Chapter 15: Lighting Controls
- R6: Heschong, L. (1979). Thermal delight in architecture. MIT press. "Necessity"
- R7: Bayomi, N., Elkholy, M., Rakha, T., & Fernandez, J. E. (2021). Passive survivability under extreme heat events: The case of AlDarb Al Ahmar, Cairo. Science and Technology for the Built Environment, 27(8), 1144-1163.
- R8: Ermann, M. (2015). Architectural acoustics illustrated. John Wiley & Sons. Chapter 3: Room Acoustics.
- R9: Ahuja, S., & Chopson, P. (2020). Automation and Machine Learning in Architecture: A New Agenda for Performance-Driven Design. Architectural Design, 90(2), 104-111.

Grading Policy

Active participation in all lecture sessions is mandatory, and it accounts for 10% of the final grade. A series of individual assignments to practice what has been covered in class is expected to be completed in a timely fashion, no late submissions are accepted. Student work will be graded based on the clarity of their project's design objectives, originality and logic of the design analysis techniques used. The comprehensiveness of the final design solutions, as well as overall quality will be factored in the evaluation. Assignments in total account for 50% of the grade. Three quizzes will be undertaken, Quiz I, II, and II accounting for 5%, 15% and 20% (totaling 40%).

Each student is required to work individually on a standard given space in a set of assignments and will be a space of their choice from their parallel design studio. The aim is to provide a platform for the course to **fully support studio activities**. Assignment 1 will provide a medium for applying project site and climate analysis skills learned to student's studio location. Assignment 2 will focus on visualizing the chosen space from a physically accurate daylighting simulation perspective apply basic lighting assessment skills for the space, with focus on performance quantification metrics. Assignment 3 will investigate thermal comfort and design techniques to achieve it techniques. Finally, the course's final assignment will combine daylighting analysis with thermal comfort. The goal is to enhance occupant comfort as well as energy efficiency for to lower building energy loads prior to any mechanical/electrical system installations.

Assignments

Please refer tp schedule for dates on each assignment
All assignments are due before midnight of the delivery day.

(Example: Assignment 1 is due 12 AM of Wednesday 09/06, which is Tuesday night)

Required software: Rhinoceros 7.0 for 3D modeling, Climate Studio and Climate Consultant., COVE tool

Ladybug Tools and any other software that will be demonstrated is optional, unless otherwise instructed.

Readings: All assigned readings should be finished before the class on Monday unless otherwise not

Description of Graded Components

Your text here.

[Include a descriptive blurb for every component that counts toward the final grade, giving students a sense of the kind and quantity of work expected. Note: at Georgia Tech, final grades are awarded A–F with no +/– grades permitted.]

Example Studio Grading Rubric

- A grade of "F" indicates failure to meet studio requirements, including attendance and minimum presentation requirements.
- A grade of "D" means significant attendance problems and failure to meet basic studio requirements.
- A grade of "C" means the basic requirements of the studio have just been met, with a plausible but substantially undeveloped project.
- A grade of "B" means basic requirements are met and the project is developed enough for evaluation against studio themes and criteria.
- A grade of "A" means the project clearly demonstrates understanding of studio themes, criteria, and self-motivated exploration beyond basic requirements.

Grading Scale

A 90–100%
B 80–89%
C 70–79%
D 60–69%
F Below 60%

Course Schedule

Please see the annotated class schedule on Canvas. This schedule is subject to periodic revisions; updated schedules will always be posted on Canvas.

ARCH 6531/3231		9:30-10:45		9:30-10:45		
WEEK	MONDAY	TOPIC	WEDNESDAY	TOPIC	ASSIGNMENT	READING
1	17-Aug	course intro	19-Aug	sustainable design		
2	24-Aug	climate and site	26-Aug	site analysis	ASSIGNMENT 1	
3	31-aug	physics of light	2-Sep	daylight design		

4	7-Sep	visual comfort	9-Sep	climate based daylight metrics		
5	14-Sep	physics of heat	16-Sep	test review	ASSIGNMENT 2	
6	21-Sep	test 1	23-Sep	thermal comfort		
7	28-Sep	thermal comfort 2	30-Sep	wind and natural ventilation		
8	5-Oct	fall beak	7-Oct	envelope performance		
9	12-Oct	physics of sound	15-Oct	acoustical performance		
10	19-Oct	review test 2	21-Oct	test 2	ASSIGNMENT 3	
11	26-Oct	vulnerability	28-Oct	Case study		
12	2-Nov	systems in practice	4-Nov	simulation on the cloud		
13	9-Nov	integrated passive design	11-Nov	solar decathlon	ASSIGNMENT4	
14	16-Nov	arch classes cancelled	18-Nov	no studio classes-no class		
15	23-Nov	review final exam	25-Nov	thanksgiving break		
16	30-Nov	review final exam	3-Dec	reading day		
17	7-Dec	Exam				

Attending SoA lectures during studio time on Mondays or Wednesdays from 12:30–1:30 p.m. is required for M. Arch students and highly recommended for B.S. Arch, M.S., and Ph.D. students.

Supplemental Information *(required for all M. Arch courses)*

NAAB Conditions for Accreditation

For Professional Degree Programs in Architecture (2020)

The accredited degree program must demonstrate that each graduate possesses the knowledge and skills defined by the criteria below. The knowledge and skills defined here represent those required to prepare graduates for the path to internship, examination, and licensure and to engage in related fields. The program must provide student work as evidence that its graduates have satisfied each criterion.

The criteria encompass two levels of accomplishment:

- *Understanding*—The capacity to classify, compare, summarize, explain, and/or interpret information.
- *Ability*—Proficiency in using specific information to accomplish a task, correctly selecting the appropriate information, and accurately applying it to the solution of a specific problem, while also distinguishing the effects of its implementation.

Program Criteria (PC) and Student Criteria (SC): The NAAB establishes PC and SC to help accredited degree programs prepare students for the profession while encouraging education practices suited to the individual degree program.

For the purpose of accreditation, while this course will cover more criteria than the ones listed below, the following will be actively covered:

PC.3 Ecological Knowledge and Responsibility—How the program instills in students a holistic understanding of the dynamic between built and natural environments, enabling future architects to mitigate climate change responsibly by leveraging ecological, advanced building performance, adaptation, and resilience principles in their work and advocacy

Course Policies

USG + Georgia Tech Required Policies

Attendance and/or Participation

Active Participation at all class meetings is mandatory and crucial to the successful completion of the class. Absences will be excused only for medical or family emergencies, Institute-

approved events, and religious holidays documented in writing. (According to a new policy, you must notify your instructor in writing during the first two weeks of the semester about any anticipated absences for religious holidays.) Late arrivals will be counted as absences.

Attendance of SoA lectures during studio time on Thursday from 12:30-1:30 p.m. is required for M. ARCH students and highly recommended for our BS ARCH, MS, and Ph.D. students.

NOTE: Absences due to special and/or unforeseen circumstances must be discussed with the Instructor as early as practically possible.

SoA Attendance Policy

Active participation at all class meetings is mandatory. Absences will be excused only for medical or family emergencies, Institute-approved events, and religious holidays documented in writing. (Notify your instructor in writing during the first two weeks of the semester about any anticipated religious holiday absences.) Late arrivals will be counted as absences.

Attendance of SoA lectures during studio time on Monday or Wednesday from 12:30–1:30 p.m. is required for M. Arch students and highly recommended for B.S. Arch, M.S., and Ph.D. students.

NOTE: Absences due to special and/or unforeseen circumstances must be discussed with the instructor as early as practically possible.

Missing three classes without an approved excuse will result in a letter grade reduction. Missing more than three classes, excused or unexcused, might result in a meeting with your instructor and the Architecture Program Office to determine a course of action and can result in an incomplete grade (I) or a failing grade (F) of this course.

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Students are highly encouraged to submit absence verification for documented illness, hospitalization, accidents, family emergencies, or lengthy illnesses to the Dean of Students: https://studentlife.gatech.edu/request-assistance

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards.

Review Georgia Tech's Honor Code and the student Code of Conduct. Any student suspected of cheating or plagiarism will be reported to the Office of Student Integrity.

For expectations of student and instructor conduct, consult Code of Conduct (rules/19) and Student-Faculty Expectations (rules/22).

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body.

The Student-Faculty Expectations Agreement articulates some basic expectations that you can have of me and that I have of you. Simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek.

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource from Georgia State University includes template syllabus statements for each Core IMPACTS area that you may adapt for your course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment, obtain an accommodations letter, and discuss your special needs. Please also schedule an appointment with your instructor to discuss your learning needs.

Optional Policies, Expectations, and Resources

1. Generative AI Use Encouraged

In this course, the use of Generative AI tools (insert appropriate AI tool(s) here) is encouraged as part of your learning and creative process. Responsible use is expected. All submitted work must include a brief AI Usage Statement outlining: which tools were used, when they were used, what prompts or questions were given, and how the AI output informed or shaped your final submission. Use of Generative AI must comply with Georgia Tech's Honor Code and academic integrity guidelines.

2. Limited Generative AI Use Permitted

Use of Generative AI (insert appropriate AI tool(s) here) is permitted but only within instructor-approved boundaries. Its use must be transparent and documented in a required AI Usage Statement with each submission, including: tool used and date of access, the input (prompt) provided, a copy of the output, and a description of how you used or edited the AI-generated content. Failure to disclose its use may be considered a violation of Georgia Tech's academic integrity policies.

3. Generative AI Use Prohibited

The use of Generative AI tools (such as Copilot, ChatGPT, Perplexity, etc.) is not allowed in this course. All assignments must represent your unassisted original thought and individual effort. Any use of Generative AI will be treated as a violation of Georgia Tech's Honor Code.

4. AI Use is Assignment Dependent

Use of Generative AI in this course will vary by assignment. Check each assignment's instructions to determine what AI use is allowed. Do not assume that because AI was allowed for one assignment, it will be allowed on others. When allowed, responsible use is expected with a required AI Usage Statement.

Draft GT AI policy: https://provost.gatech.edu/sites/default/files/2025-10/AI%20Policy_draft_10.14.2025%202.pdf

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

All phase deliverables are posted on the syllabus and will be confirmed as the semester progresses. Individual team extensions will not be granted. Individual exams will be given on posted dates and no make-up exams will be permitted without prior approval from the faculty.

Inclement Weather and Digital Learning Days

If a weather-related event seems likely to affect campus operations, instructors of record will be notified as soon as possible via email by the Office of the Provost. Once a decision to pivot is made, broader campus will be notified via email, GTENS, and Canvas notifications.

Instructors have discretion to cancel class or pivot to digital instruction during a weather-related event. Students may not be asked to attend in person or required to participate in a class session outside of the regularly scheduled time if campus has shifted to a digital learning day.

Student Use of Mobile Devices in the Classroom

This class requires the use of mobile devices in the form of laptops and tables as they can enrich the educational experience unless they are used for non-class related activities. ,it is recommended for students not to use their cellphones during class since research demonstrates that this can be distracting to their students and most of the time their use is not related to academic activities

Digital Proctoring

This class does not consider or requires the use of digital proctoring tools.

CIOS — Course Evaluations

At the end of the term, students are asked to complete the online course evaluation for all courses at Georgia Tech (https://gatech.smartevals.com). CIOS scores and comments have different degrees of visibility based on roles:

Reporting access by role	CIOS Scaled Results	CIOS Comments	TA's Scaled Results	TA's Comments
Instructor	Their Own	Their Own	All within their own course	All within their own course
TA Supervisor	N/A	N/A	All within their own course	All within their own course
Teaching Assistant	None	None	Their Own	Their Own
School Administration	All within their own unit	None	All within their own unit	All within their own unit
Students	All – Summary only	None	None	None

More information: CIOS Student FAQ

Campus Resources for Students

Undergraduate Student Academic Success Resources

A list of resources for undergraduate students' academic success and advising can be found at Success at Tech. Academic Support (a unit in the Office of Undergraduate Education & Student Success) provides free tutoring: success.gatech.edu/tutoring.

Graduate Student Academic and Professional Success Resources

A list of resources for graduate students is available on the Office of Graduate and Postdoctoral Education website.

Student Well-Being

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness-related resources has been compiled by the Office of the Vice President for Student Engagement and Well-being.

Library & Archives

Contact your Architecture Library subject specialist, Catherine Manci (catherine.manci@library.gatech.edu), for research help and information on available resources.

Contact your Architecture Archives liaison, Jody Thompson (jody.thompson@library.gatech.edu), for assistance with archival research and collections.

Georgia Tech Library: https://library.gatech.edu/ Georgia Tech Archives: http://library.gatech.edu/archives

Approved Communication Platforms

Georgia Tech Approved Communication Platforms

Georgia Tech Values Statement

At Georgia Tech, we see different backgrounds and perspectives as essential to learning, discovery, and creation. We strive to remove barriers to student success and to build a welcoming community where everyone has the opportunity to contribute to our mission. As outlined in our strategic plan, we want to create an environment of holistic learning where all individuals can grow and learn to lead healthy, purposeful, impactful lives.

SoA & College of Design Policies

Archiving

At the end of the semester, all students are required to submit physical and/or digital examples of their work to their instructors or administration for archiving no later than one week after the end of term. By enrolling, each student grants a license to reproduce and display their work online, in forthcoming print publications, and in public exhibitions.

Ownership

For the purposes of continuous improvement efforts, such as accreditations and periodic program reviews, the School will select samples of student work submitted to satisfy course requirements. This includes digital files, papers, drawings, models, etc. Collected samples may be returned to students upon request.

College of Design Facility Rules and Guidelines

Please consult the Georgia Tech Student Handbook regarding the use of facilities and all Institute policies. Aerosol sprays of any kind are strictly banned from the studio and surrounding areas. A spray painting booth is available in the College of Design shop on the ground floor of the East Architecture Building.

Course Expectations & Guidelines

Per the GT Catalog, all work produced in the College of Design as part of a degree program becomes the property of the College; it may be retained or returned at the discretion of the faculty. The faculty of the School of Architecture reserves the right to refuse credit for any project executed outside the precincts of the College or produced without proper coordination with the faculty.

Emergencies

In case of emergency (e.g., fire, accident, or criminal act), please call the Georgia Tech Police at 404-894-2500. Perry Minyard, IT Support Administrator for the College of Design, is also a firefighter and EMT certified in performing CPR.