

environmental control systems 2

university of oregon

course Arch 492 (crn:30458) Arch 592 (crn:30528)
credits 4 credit hours
course website <https://canvas.uoregon.edu/courses/109880>

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lectures Tuesday & Thursday 14:00-15:20, LA 177
labs (below)

section		time	day	room	instructor
30459	undergraduate	1800-1920	t	278 LA	Amir Nezamdoost
30460	undergraduate	0830-0950	w	249 LA	Mike Helmer
30461	undergraduate	0830-0950	r	286 LA	Niyati Naik
30462	undergraduate	1600-1720	r	222 LA	Mike Helmer
30529	graduate	1600-1720	t	405A LA	Amir Nezamdoost
30530	graduate	1000-1120	w	249 LA	Niyati Naik

prerequisites

Required course for Architecture and Interior Architecture majors at an appropriate time in the curriculum sequence. ARCH 491/591 is not a prerequisite for 492/592. Open to non-architecture majors with instructor approval. The course assignments are designed to integrate with a concurrent design studio problem. However, if you are not in a design studio at present, alternate arrangements can be made.

course description

This survey course offers technical knowledge essential to designing high performance spaces. Architecture informed by human sensation fosters beauty and supports health, comfort, and productivity. Topics addressed in detail include water supply, water recycling, daylighting, electric lighting, acoustics, and life safety. The course comprises lectures, labs, and hands-on design projects to imbue technical knowledge of sustainable design.

texts

Required texts are available for purchase at the Duck Store or supplied on Canvas or accessible online, and required and recommended are on reserve in library.

required:

- *Mechanical and Electrical Equipment for Buildings*, 12th Edition; Grondzik, Kwok, John Wiley & Sons, 2015.
- Additional required readings available on Canvas.

recommended:

- *In Praise of Shadows*, Tanizaki, Leete's Island Books, 1977.
- *The Eyes of the Skin: Architecture and the Senses*, 2nd Edition; Pallasmaa, John Wiley & Sons, 2005.
- Or online edition, 2012; online 2012 ed: https://alliance-primo.hosted.exlibrisgroup.com:443/UO:uo_alma:CP71204796760001451
- *Thermal Delight in Architecture*, Heschong, The MIT Press, Cambridge, MA, 1979.
- *The Green Studio Handbook*, Kwok, Grondzik, Architectural Press, Oxford, 2011.
- Additional optional readings available on Canvas.
- We expect students to use Additional required readings are derived from a number of sources as noted on the course schedule—these sources are either on physical or electronic library reserve. Specific reading assignments are noted by page, section, or chapter numbers

other:

- Daylighting and Integrated Lighting Design, Meek and Van Den Wymelenberg, Routledge, 2015
- Sun, Wind & Light: Architectural Design Strategies (2nd or 3rd edition), DeKay and Brown, John Wiley & Sons, 2014.
- Daylighting Design in the Pacific Northwest, Meek and Van Den Wymelenberg, UW Press 2012
- Light Revealing Architecture, Millett, John Wiley & Sons, 1996.
- Environmental Control Systems: Heating, Colling, Lighting, Moore.

naab criteria

This course addresses the following **2015 NAAB Student Performance Criteria** (bold are addressed explicitly). Understanding addressed through interactive lectures, readings, quizzes, section activities. Criteria in bold, are tied to specific demonstrations through quizzes, section activities, project homework, and studio integration assignment.

realm A: critical thinking and representation

A.1 Communication Skills; A.2 Design Thinking Skills; A.3 Visual Communication Skills; A.4. Technical Documentation; A.5. Investigative Skills; A. 6. Fundamental Design Skills; A. 7. Use of Precedents; A.11. Applied Research

realm B: building practices, technical skills and knowledge

B.1 Pre-Design; B. 2. Accessibility; B. 3. Sustainability; B. 4. Site Design; B. 5. Life Safety; B. 6. Comprehensive Design; B. 8 Environmental Systems; B. 10. Building Envelope Systems; B. 11. Building Service Systems

realm C: integrated architectural solutions

C. 1. Collaboration; C. 2. Human Behavior; C. 3 Client Role in Architecture; C. 6. Leadership; C. 7. Legal Responsibilities; C. 8. Ethics and Professional Judgment; C.9. Community and Social Responsibility

learning outcomes

- Develop an understanding of water and waste systems in buildings and their application to architectural design, net-zero water systems, and waste/water recycling technologies; apply knowledge to generate design concepts associated with your studio project.
- Develop an understanding of spatial environmental qualities and quantities for the design and evaluation of spaces with respect to the integration of daylight and electric light, acoustics, life safety, and water and waste.
- Develop an understanding of daylighting systems, building massing with respect to solar orientation, metrics and components; demonstrate knowledge application for the evaluation and redesign of existing spaces and iterative design of new spaces.
- Develop an understanding of electric lighting systems, sources, measurements, and calculations; apply the knowledge to design an integrated lighting storyboard associated with your studio project.
- Develop an understanding of sound behavior in space and the application of architectural acoustics to enhance space performance, manage noise, and control sound transmission between spaces; apply the knowledge to design an acoustical storyboard associated with your studio project.

instructional methodology

This course is organized by interactive lectures with supplemental design labs, in which students engage in independent and cooperative project-based learning. The instructor and guest speakers will present topical lectures covering the basic information related to the designs of spaces that celebrate human senses and provide indoor comfort for human performance in the areas of daylighting, electrical lighting, acoustics. Lectures also address matters of life safety, egress, recycling water and waste for buildings. Students are expected to complete the required readings prior to each lecture and expand on the lecture topics in design-based individual and group activities during both lectures and the design labs. The lectures and design labs are intended to support student explorations covering basic knowledge and demonstrating techniques, informing students of resources, suggesting approaches and methods, critiquing student work in an ongoing basis, and raising questions for group discussions. Peer teaching and teamwork explorations by students are viewed as an essential part of the course and are as important as teaching by the instructors.

graduate/undergraduate student effort differential

Graduate students are expected to perform work of higher quantity and more in-depth than undergraduate students, typically with forty hours of student engagement for each student credit hour (compared to thirty hours of undergraduate student engagement for each student credit hour). Therefore, for this 4-credit course a graduate student should expect to commit approximately 160 while it is expected that an undergraduate student should expect to commit approximately 120 hours to this course over the duration of the term. Specific requirements that reflect this higher level of engagement for Graduate students will be provided on projects. Graduate students, as part of their final studio integration storyboard will also complete an analysis and summary of a scholarly article from an architectural research journal on building performance and comment on its relevance to the principles and concepts of this course, specifically relevant to their final studio storyboard. This is intended to give graduate students a unique and important experience relevant to design practice while challenging graduate students to dig more deeply into how architectural research is integrated into practice.

attendance & quizzes & iClickers

Attendance is required for all lectures and design labs. There are small pop-up quizzes that will be administered during lectures covering each week's topics. This is intended to keep track of student's participation, learning progress, and applications of the course material. iClickers will be used for in-lecture quizzes and to record attendance (old iClickers models that function are acceptable). Students should purchase and have their registered clickers with them for all lectures. Participation in all quizzes and lecture attendance polls recorded via iClickers will account for 15% of the total course grade, while scored quizzes will account for 5% of the course grade.

There are no make-up activities for the in-lecture quizzes that are missed due to unexcused absences. Students with three or more unexcused absences from lectures and design lab sections combined will receive a 5% reduction in overall course score. More than three unexcused absences may result in a failing grade and will be treated on a case by case basis. Excused absences (such as illness or personal emergency) must be reported to the instructor PRIOR to the missed class. Any excused absences must be approved in writing prior to the missed class. A missed quiz may be made up ONLY in the case of a verified emergency situation or a pre-excused absence approved prior to the time of the quiz.

deadlines

- All project assignment deadlines are noted on the course schedule, and are Monday at 1PM unless noted otherwise. A single PDF file must be uploaded to Canvas prior to the deadline. Please keep PDF file sizes below 10MB for all project assignments.
- All lab activity documentation is due on Monday at 1PM following the design lab. A single PDF file must be uploaded to Canvas prior to the deadline. Please keep PDF file sizes below 10MB for all lab activity documentation.
- Late assignments and lab activities will be accepted until the Friday (11:59PM) after they are due and are subject to up to 5% per day late penalty. No assignments or lab activities will be accepted beyond the Friday following the Monday they were due. Missing assignments and lab activities will result in a zero grade.
- Final Studio Integration Storyboards must be submitted as scheduled per the syllabus. Final Studio Storyboards presentations/reviews are scheduled during the University's designated final examination period. Final Studio Integration Storyboards must be submitted via Canvas and will also need to be printed per the assignment handout. ***Failure to attend the final presentations will result in a 50% Final Studio Storyboard grade penalty.***

Incomplete and extenuating circumstances

A grade of **incomplete** will be given ONLY for medical emergencies and requires written pre-approval from the instructor. The instructor reserves the right to withhold a final course grade if equipment on loan is not returned in working order by the time of the final studio storyboard presentations. Requests for extra-credit or compensatory work to make up for missing assignments or quizzes will not be considered.

If unforeseen and uncontrollable circumstances during the term make it impossible for you to fully participate in course activities as scheduled, such a situation must be brought to the instructor's attention *immediately*—delayed requests for compassionate consideration will not be accepted. Any request for deviation from published and/or assigned course requirements must be made in a timely manner and be agreed to in writing by the instructor.

grading

Multiple measures will be used to assess your performance. The ability to apply information in design situations will be assessed via *projects/studio storyboards*. Active participation in the learning process will be assessed via *weekly questions* and *section attendance and participation quizzes*. Regular class attendance and participation (including sections) and timely assignment submission are minimum expectations for successful course completion.

The Department of Architecture maintains a long and successful tradition of peer teaching that benefits both students, GEs and TAs. Graduate Employees will conduct both graduate and undergraduate labs under the direct supervision of the instructor. These sessions will be conducted according to protocols that have been approved by the instructors and that are common to all sections of the course. GEs will lead labs and may occasionally provide supplementary lessons/lectures on certain topics. However, the instructor will meet with the GEs on a weekly basis at least, to coordinate material and ensure that sections are being run consistently and according to the instructors' specifications. GEs will work under the direct supervision of the instructor(s), who will have ultimate responsibility for determining and entering grades. All grading will be done according to clear criteria (grading rubrics) that are used by the course instructors and all GEs assisting in the course. The course instructors will regularly monitor the grading activities of GEs with respect to accuracy and fairness. All graduate students have the option of having their work evaluated solely by the instructors. The professor reviews and approves all project grades prior to their release to the students.

Your grade will be based on the following scale (and not curved).

A+ 97.5-100%; A 92.5-97.4%; A- 89.5-92.4%

B+ 87.5-89.4%; B 82.5-87.4%; B- 79.5-82.4%

C+ 77.5-79.4%; C 72.5-77.4%; C- 69.5-72.4%

D+ 67.5-69.4%; D 62.5-67.4%; D- 59.5-62.4%

The course may be taken on either a graded or P/N basis. A “pass” requires a minimum equivalent grade of C- (undergraduates); B- (graduates). Students should check the deadlines for change of grade options by the end of the first week. The overall course grade will be based upon a cumulative tabulation of the various elements described above, weighted as follows:

lecture participation	15%
lecture quizzes	5%
lab activities*	10%
five projects	50%
final studio storyboard	20%

*Remember, all lab activity documentation due every Monday at 1pm following lab via Canvas.

other academic policies

Collaboration vs Own Work: Group discussion of projects is acceptable and encouraged. Collaborative work (which can be very educational) has limits, however. Copying another’s work, or a portion of work, for submission as your own, or allowing others to copy your work, is grounds for a failing grade and the basis for potential referral to the Director of Student Judicial Affairs. All students are expected to know and understand the Oregon Student Conduct Code. Any project submitted for grading is—by the act of submission—certified to be the true work product of the individual who submits the work. This means that the work reflects a personal exercise of judgment regarding accuracy, quality, and completeness. Some projects are designated as group projects, and in these cases, all group member names should be included on the submission.

Academic Misconduct: You are expected at all times to do your own work unless the activity or project is specified as a group project. Copying content from other students and submitting it as your own work is grounds for failing the class. The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct.

Plagiarism: Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas). If there is any question about whether an act constitutes academic misconduct, it is the student’s obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at: <http://library.uoregon.edu/guides/plagiarism/students/index.html>

Accommodations for Learning Needs: The University of Oregon is working to create inclusive learning environments. Please notify GEs or course instructor within the first two weeks of the quarter if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. We also encourage you to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoac@uoregon.edu. Ideally, I would like to receive a notification letter before the end of the first week of classes so that we can discuss ways to provide accommodations within the classroom and department.

Inclusion Statement: The School of Architecture and Allied Arts is a community that values inclusion. We are committed to equal opportunities for all faculty, staff and students to develop individually, professionally, and academically regardless of ethnicity, heritage, gender, sexual orientation, ability, socio-economic standing, cultural beliefs and traditions. We are dedicated to an environment that is inclusive and fosters awareness, understanding, and respect for diversity. If you feel excluded or threatened, please contact your instructor and/or department head. The University Bias Response Team is also a resource that can assist you. Find more information at their website at <http://bias.uoregon.edu/index.html> or by phoning 541-346-2037.

Statement Regarding Sexual Violence: The UO is committed to providing an environment free of all forms of

discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. If you (or someone you know) has experienced or experiences gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), know that you are not alone. UO has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware that all UO employees are required reporters. This means that if you tell any UO employee (including GEs or instructors) about a situation, the UO employee may have to report the information to their supervisor or the Office of Affirmative Action and Equal Opportunity. Although UO employees have to report the situation, you will still have options about how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone confidentially, you can call 541-346-SAFE, UO's 24-hour hotline, to be connected to a confidential counselor to discuss your options. You can also visit the SAFE website at safe.uoregon.edu.

course schedule

2018.04.03_schedule							
Week	Day	Lecture	Readings	Optional	Assignment	Lab Activity	
01	Tues. 04.03	Course Introduction: Architecture of the Senses <i>WATER Demonstration</i>	Course Syllabus + Scheule (handout)	<i>Eyes of the Skin</i> by Juhani Pallasmaa (Online, Library)		Water Budget	
	Thur. 04.05	Architecture as Hydro-Logical Infrastructure Brook Muller (Guest) A Northwest Vision for 2040 Water Infrastructure Rhys Roth (Guest)	Start MEEB water readings for next week	(skim) Toward Net Zero Water (Canvas) (skim) A Northwest Vision for 2040 Water Infrastructure (Canvas)	Assign: Water Shapes Form		
02	Mon. 04.09					Due: W01 Lab 1PM	
	Tues. 04.10	Fundamentals of Water & Waste in Buildings: Design + Alternative Recycling Strategies	MEEB: pp. 798-818, 927-932, 970-978			Water Shapes Form	
	Thur. 04.12	Integrating new paradigms of water & sanitation into design Kory Russel (Guest)					
03	Mon. 04.16					Due: Water Shapes Form - 1PM	Due: W02 Lab 1PM
	Tue. 04.17	<i>DAYLIGHT Demonstration</i> Why Daylight?	MEEB: pp. 242-250; The Benefits of Natural Light (Canvas)	<i>In Praise of Shadows</i> pp. 12-35 (Canvas, Library) MEEB: pp. 257-267	Assign: Aperture, Light, & Form	Measure & Draw the Light	
	Thur. 04.19	Light, Vision, Lighting Quantity & Quality	MEEB: pp. 584-590, 592-596, 598-601	MEEB: pp. 612-616			
04	Mon. 04.23					Due: Aperture, Light, & Form - 1PM	Due: W03 Lab 1PM
	Tues. 04.24	Design for Daylight - Sidelighting Strategies	MEEB: pp. 250-252 280-286; ILD: Section Depth , pp. 71-76 (Canvas)	Building Daylight Models (Canvas); ECS: pp. 309-320	Assign: Studio Integration Daylight Modelling	Factoring Daylight	
	Thur. 04.26	Design for Daylight Toplighting Strategies	MEEB: pp. 252-257; ILD: Toplighting , pp. 101-106 (Canvas)	ECS: pp. 301-309; MEEB: pp. 621-626			
05	Mon. 04.30					Due: W04 Lab 1PM	
	Tues. 05.02	<i>ELECTRIC Demonstration</i> Electric Lighting Metrics, Sources & Luminaires	MEEB: pp. 627-637, 697-711; (skim) 639-653, 658-669			Lumen Method & Point Source Calculations	
	Thurs. 05.03	Electric Lighting Process & Calculations	MEEB: pp. 671-681, 728-729, 738-739, 744-746				
06	Mon. 05.07					Due: Studio Integration Daylight Modelling - 1PM	Due: W05 Lab 1PM
	Tues. 05.08	Electric Lighting Design: Strategies and Distribution & Integrated Lighting Controls	MEEB: pp. 682-692, 717-728		Assign: Integrated Lighting Storyboard	Lighting Field Trip TBD (location)	
	Thurs. 05.10	Lighting Design & Application TBD (Guest)					
07	Mon. 05.14					Due: W06 Lab 1PM	
	Tues. 05.15	<i>ACOUSTICS Demonstration</i> Acoustical Metrics, Room Acoustics	MEEB: pp. 1015-1028, 1058-1072			Acoustic Measurements and Calculations	
	Thurs. 05.17	Acoustics Field Trip TBD (Location)					
08	Mon. 05.21					Due: Integrated Lighting Storyboard - 1PM	Due: W07 Lab 1PM
	Tues. 05.22	Architectural Acoustics & Noise Control	MEEB: pp. 804-807, 1044-1049, 1073-1074, 1080-1083		Assign: Acoustics Storyboard	Acoustic Design	
	Thurs. 05.24	Acoustical Design & Application TBD (Guest)	MEEB: (skim) rest of chapter related to airborne and structural-borne noise.				
09	Mon. 05.28	<i>Note: UO Holiday - Memorial Day</i>				Due: Acoustics Storyboard - 1PM	Due: W08 Lab 1PM
	Tues. 05.29	<i>SAFETY Demonstration</i> Egress, Fire & Smoke Protection	MEEB: pp. 1141-1150, 1158-1171, 1174-1182		Assign: Final Studio Storyboard	Studio Integration Support	
	Thurs. 05.31	Integrated Design Process & Course Review	MEEB: pp. 798-818				
10	Studio Review Week - No Classes						
11	Mon. 06.11	Final Review Pin Up <i>12-12:30PM Set Up; 12:30PM - 2:30PM Review; 2:30-3PM Break Down</i>				Due: Final Studio Storyboard (Canvas & Printed 12:30PM, Rooms TBD)	