UNIVERSITY OF OREGON

Syllabus: Climate-Responsive Design Seminar

ARCH/ENVS 400M/500M
Tues/Thurs 12-1:50 (4 credits)
Alexandra Rempel, Instructor **Fall 2017**

Course description

How did people design their shelters for thermal comfort, and even thermal delight, before fossil fuels made mechanical heating and cooling possible? This course explores the world's diversity of climates and biomes, focusing on indigenous buildings that have developed from centuries of experimentation and innovation. These structures are formed by necessity of local wood, stone, skins, leaves, and earth. They often connect human communities with minimal need for transportation, and they have met great pressures to minimize energy use for providing warmth and coolness. As such, they form the great majority of the world's truly sustainable buildings, and they offer fascinating lessons for contemporary green design. The goals of this course are to reveal these lessons, to evaluate existing green buildings in light of them, and to apply them in the redesign of existing projects. This is a seminar course taught through class discussion and field investigation. Discoveries, insights, and experimentation will be synthesized through weekly assignments and three small projects.

Prerequisite: None

Contact information

Instructor: Alexandra Rempel, Assistant Professor, Environmental Studies Program
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Materials

Required. No materials are required: all readings will be posted on Canvas, and instruments will be available to check out, though their limited number will require groups to share among themselves. However, students are encouraged to add to their building science resources with some or all of the following:

Recommended (estimated prices on Amazon).

1. Weather meter that measures air temperature and velocity, e.g. Ambient Weather WM-2 ($30)
2. Illuminometer, e.g. LX1330B ($32)
3. Surface thermometer, e.g. Dr. Meter IR-20 ($15)
4. Air flow bubbles, e.g. Dazzling Toys Touchable Bubbles ($8 for six)
5. Thermal Delight in Architecture (Lisa Heschong) MIT Press, Cambridge MA ($15 used)
6. Buildings Without Architects (John May) Rizzoli Int'l Publications, New York ($10 used)

Field work and instruments

Sturdy but in some cases expensive field instruments will be available; these will be checked out to individual students who will be responsible for their care and return. For graduate students, one assignment will involve field measurements at a Native American or pioneer dwelling site in western Oregon. Entry fees of $15 or less are typically required to enter these sites. Undergraduate field work will occur on campus.

Projects

Three projects will engage groups of 2-4 to explore climate-responsive design elements and to apply them in various ways, including sketches, drawings, and explanatory narratives. Projects must be collaborative, and at the same time, individual effort must be recognizable. Grades will be assigned individually to encourage all group members to participate fully in each project.

Wiki: Patterns of Climate-Responsive Design

Reading, research, and discussion will be distilled into a wiki that summarizes patterns for climate-responsive design for each climate studied, and some assignments will also be uploaded to the Canvas wiki pages.

Content

Week	Topics
1: Bioclimatic Design	Energy use in buildings · Olgyay's concept of bioclimatic design · Vernacular architecture · How to look for bioclimatic design elements · Developing climate intuition · **Developing a course wiki of climate-responsive design patterns** ·
2: Climate + Comfort	Köppen and ASHRAE climate classifications · Interpreting climate data · Biomes · Microclimates · Thermal delight · Standard and adaptive thermal comfort · Psychrometric chart · Visual comfort · Characterizing microclimates on campus: Outdoor shelters, atria, balconies, tunnels, etc. for temperature, relative humidity, wind velocity, surface temperatures, illumination, perception
3: West Coast Marine / Pacific Northwest	Köppen Group C · Temperate rainforests · Soils · Cloud cover · Oregon Native American dwelling diversity · Contemporary Northwest regionalism: Miller-Hull · Mithun · Patkau Architects · Timberline · Islandwood School · (E-class + field work)
4: Project 1	**Project 1** compilations and discussion: Critical evaluations of the climates, biomes, and architectural responses of Native American vernacular and Pacific Northwest regional contemporary buildings.
5: Arid + Semi-Arid	Köppen Group B · Soils and adobe · Pueblos · Cliff dwellings · Kivas · Passive solar buildings · Zion visitors' center · Stanford Center for Global Ecology · Santorini cliff dwellings · Wind catchers · Qanats · Slit windows · Turkish column dwellings · Termites · Mongolian ger · Indian courtyard homes · Bedouin black tents · Volcanic materials · Water capture · Trullo stone houses · Cappadocian + Andalusian cave dwellings · South American courtyard houses
6: Humid Subtropical	Köppen Group C · Southeastern U.S. dog-trot + plantation houses · Post-Katrina dwellings · Auburn dwelling project · Australian Queenslander · Air velocity and comfort · Contemporary examples: Make It Right development; Auburn; Zachary House
7: Continental + Polar	Köppen Group D · Northeastern forest, mountain, and coastal climates and biomes · Native American dwellings · Shaker buildings · New England salt boxes · Queens building · Hebridean blackhouses · Devon cob · Windmills · Russian izbas · Japanese minka · Contemporary examples from Beijing, Stockholm; Köppen Group E · Northern European turf houses, castles · Alvar Aalto · Greenland turf houses · Inuit iglus and longhouses · Contemporary Icelandic and Nordic work
8: Project 2	**Project 2** compilations and discussion: Critical evaluations of the climate-responsiveness of contemporary, award-winning green buildings + proposed redesigns of 2-3 elements (Tropical climates OK)
9: Tropical	Köppen Group A · Rainforests · Island biomes · Reeds and bamboo · Brazilian clay roof tiles and shabano · Chattel houses · Colombian Paisa houses · Peruvian reed houses · Malta brewery Indonesian tongkonan · Korowai tree houses · Samoan fale · Balinese kuren · Australian aboriginal shelters · Philippine octagonal houses · Cempa stilt houses · Tjiabao Cultural Center
10: Review week	No class; office hours by appointment
11: Project 3	**Project 3:** Partial revision of an existing building to embody bioclimatic design patterns, to be presented during a mutually agreeable time in Week 11.

Learning Outcomes

By the end of the course, students will be able to:

1. Gather **climate and biome** information for a particular location and use it to identify local thermal, moisture, solar, and material resources.
2. Use weather meters, non-contact thermometers, illuminometers, flow bubbles, and other **instruments** to investigate existing buildings and to characterize microclimates.
3. Explain the significance of characteristic **vernacular responses** to specific climatic conditions for numerous diverse climates.
4. Analyze and evaluate the **bioclimatic responsiveness** of existing built examples.
5. Synthesize relevant **bioclimatic principles** and apply them to new and existing designs.

Evaluation

Student accomplishment will be evaluated on the basis of weekly assignments, in-class discussion and presentations, and design projects as follows. The single lowest assignment grade will be dropped. All grades will be recorded in Canvas so that students can track their progress, and midterm grades will be provided as well.

Class Participation:	25%
Assignments:	30%
Projects (3 @15% each):	45%

Letter grades reflect the following:

A: Demonstrates an excellent, thorough, nuanced understanding or accomplishment. Discussion comments and questions are thoughtful and constructive, reflecting careful study of the reading assignments. Group work is active, constructive, collaborative, and shows initiative and resourcefulness. Written work is comprehensive, clear, concise, thoughtful, accurate, and free of grammatical and spelling errors; computational work is complete and accurate; visual work is complete, well-organized, and accessible.

B: Demonstrates a good understanding or accomplishment. Discussion comments and questions are constructive, reflecting good attention to the reading assignments and solid comprehension. Group work is active, constructive, and collaborative, but shows limited initiative and resourcefulness. Written work contains good but not exemplary content, is difficult to follow in places, and/or contains a small number of grammatical and spelling errors; computational work is generally good with minor errors; visual work is complete and of good quality but may be mildly disorganized and/or difficult to interpret in places.

C: Demonstrates an adequate understanding or accomplishment. Discussion contributions are few in number, contain limited constructive content, and/or reflect inattention to reading assignments. Group work is attempted, but shows low energy or effort to collaborate with group members, and/or creates unusual levels of conflict. Written work is incomplete and/or superficial, difficult to follow, and/or contains numerous grammatical and spelling errors; computational work is conceptually adequate but contains significant errors; visual work is mostly complete but with shallow content and/or careless presentation.

D: Demonstrates inferior understanding or accomplishment. Discussion contributions are rare, with minimal content. Behavior in class disrupts others' learning. Group work is inferior, incomplete, or disruptive. Written work contains just enough content to pass, is thoroughly difficult to follow, and/or contains egregious grammatical and spelling errors; computational work is incomplete and contains mis-applied concepts and/or significant errors; visual work is incomplete as well as limited in content and/or presented carelessly.

F: Demonstrates unsatisfactory understanding or accomplishment. Preparation for and/or participation in class is absent. Assignments are missing.

If you are taking this course Pass / No Credit, you must earn a C- to pass as an undergraduate or B- to pass as a graduate student. Grades of Incomplete will only be given for documented, excusable (e.g. medical) situations.

Workloads

This course is expected to require 120 hours for undergraduates and 160 hours for graduate students (https://blogs.uoregon.edu/uocc/files/2016/10/Credit-Hour-and-Student-Workload-Policies-2afl3yr.pdf); please read assignments carefully to note parts that are not required for undergraduates.

Classroom participation

Students are expected to attend all classes, having carefully read and studied the assignments and having slept the night before, and to participate *fully* in discussions and group work, without distracting themselves or others. "Full participation" means devoting one's *full* attention to class: listening attentively, taking notes, asking questions, making thoughtful comments, and working with classmates to complete in-class work. This contrasts with passive behavior (sitting motionless, dozing off, or staring into space) and distracted behavior (focusing on anything other than class). *Texting, emailing, tweeting, snapchatting, instagramming, online shopping, etc. are strictly prohibited*; violations will constitute unsatisfactory class participation.

Illness and absences

Students who are ill should stay home to speed recovery and avoid infecting others. The first two absences for illness will be excused with notification by the morning of class; a doctor's note will be required to excuse further absences. Other absences will be excused with valid documentation.

Late and missing work policy

Studying the reading carefully, completing assignments, and arriving at class prepared are central to the learning process for this course. Incomplete preparation will lower participation grades for the corresponding class, but worse, lateness will circumvent the learning process. Work submitted after submission deadlines will be penalized one letter grade per day late unless valid documentation of an excuse is provided.

Academic integrity

Mutualistic collaboration, which supports the learning of all students involved, is welcome: students are encouraged to discuss reading, field work, and projects outside of class. Full collaboration is, in fact, expected in group work and projects. Parasitic collaboration, however, in which one person (the parasite) represents the work of another (the host) as his/her own, or allows the host to complete the majority of the work while the parasite contributes little, grievously damages the learning process of the parasite and risks harming the host as well. Any activity that *diminishes* the learning of *any* student involved is strictly prohibited. Activities that violate personal and institutional academic integrity include:

1. Fraud: The alteration of documents or data with the intent to deceive groupmates or the instructor.
2. Copying: Creating a submission for a graded exercise by reproducing another student's work.
3. Fabrication: Falsification or invention of information.
4. Plagiarism: Representing the work of another as one's own by omitting acknowledgement or reference.
5. Sabotage: Destruction of another's work.

If academic dishonesty is suspected, the instructor will meet with the student(s) involved to review the evidence and allow student(s) the opportunity to explain. If the instructor concludes that a violation occurred, penalties will be assessed as follows:

1. First or minor violation: Written warning and requirement to re-do the assignment in question.
2. Second or significant violation: A grade of "F" or zero on the assignment in question and requirement to complete a substantial research paper on academic integrity.
3. Third or major violation: Failing grade for the course and referral to the Dean of Students, including the instructor's written summary of events and copies of supporting documentation.

Please refer to the University of Oregon Academic Integrity website (integrity.uoregon.edu) for further details.

Archiving

At the conclusion of the course, students will be required to submit their work digitally for archiving.