UNIVERSITY OF OREGON

Syllabus: Climate-Responsive Design Seminar

ENVS 410/510
Mon / Weds 10-11:50 (4 credits)
Alexandra Rempel, Instructor **Fall 2018**

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 traditional buildings that developed from centuries of experimentation and innovation. These structures were formed by necessity of local wood, stone, skins, leaves, and earth. They often connected human communities with minimal need for transportation, and they met great pressures to minimize energy use for providing warmth and coolness. As such, they have formed 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 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 one or more 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.

Small projects

Small projects will explore the application of traditional climate-responsive design elements to contemporary buildings and will be presented to the class visually for discussion. In the collaborative field project, individual effort must be recognizable, and grades will be assigned individually to encourage full participation.

Final project: Patterns of Climate-Responsive Design

Final projects, to be completed individually, will distill two or three essential patterns for climate-responsive design in one of the climates studied. Visual presentations will be made to the class for discussion in Weeks 10 and 11. (Week 10 attendance is not required for students in Architecture or Landscape Architecture studio classes.)

Content

Week	Topics
1: Microclimates	Introductions, speed dating, and group formation · Field instrument demonstration · Exploration of campus microclimates: Outdoor shelters, atria, balconies, tunnels, etc. for temperature, relative humidity, wind velocity, surface temperatures, illumination, perception · Group documentation of day and nighttime microclimates for presentation in Week 2 · Thermal delight reading · Thermal delight essays
2: Thermal Delight + Bioclimatic Design	Presentation & discussion of microclimate investigations · Discussion of thermal delight and bioclimatic design · Vernacular architecture
3: Energy, Climate, & Comfort	Energy use in buildings · Conduction, convection, radiation · Köppen climate classification game · Interpreting climate data · Biomes · Standard and adaptive thermal comfort · Psychrometric chart exercises
4: 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
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 · South American courtyard houses · 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
6: Humid Subtropical	Köppen Group Cf · 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: West Coast Marine / Pacific Northwest	Köppen Group Cs · Temperate rainforests · Soils · Cloud cover · Pacific Northwest Native American dwellings· Contemporary Northwest regionalism: Miller-Hull · Mithun · Patkau Architects · Timberline · Islandwood School
8: Continental	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
9: Polar	Köppen Group E · Northern European turf houses, castles · Alvar Aalto · Greenland turf houses · Inuit iglus and longhouses · Contemporary Icelandic and Nordic work · No class Weds (Thanksgiving)
10: Review week	Mon: Polar projects; Weds: Final project presentations by students not in studio courses
11: Final projects	Day & time TBA: Final project presentations by students in studio courses

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%
Small Projects (2 or 3):	30%
Final Project:	15%

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 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 email notification by the morning of class; documentation will be required to excuse further absences. Other excusable absences, such as UO-related travel, 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. One-sided collaboration, however, in which one person represents the work of another as their own, or allows that person to complete the majority of the work while contributing little, grievously damages the learning process of both. 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.
6. Coasting: Contributing little to a group effort while accepting credit for the group's accomplishments.

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.