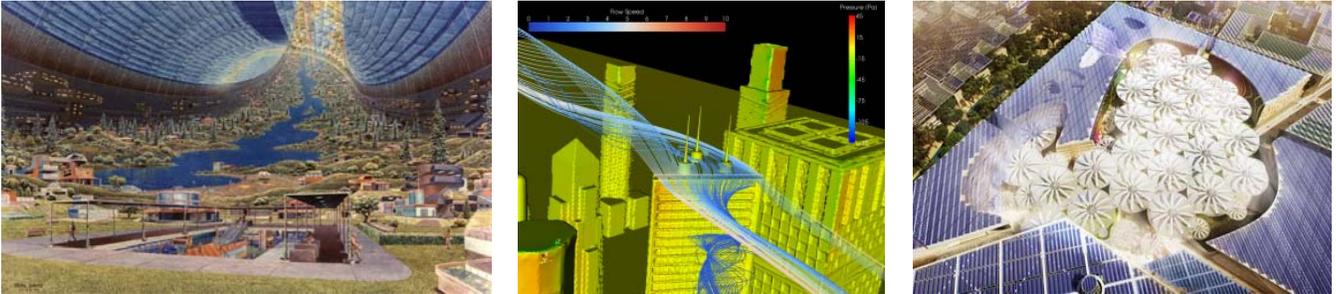


ARCH 5550: Integrating Architecture and Landscape: Modeling Zero Energy/Zero Impact *Envisioning the Sustainable Campus*

Integrating carbon, energy, and water management strategies toward zero- and net-positive design



Integrity(n) *an undivided or unbroken completeness or totality with nothing wanting; "the integrity of the nervous system is required for normal development"; unity, wholeness, completeness - the state of being complete and entire; having everything that is needed.*

*What if every intervention resulted in greater biodiversity; increased soil health; additional outlets for beauty and personal expression; a deeper understanding of climate, culture and place; a realignment of our food and transportation systems; and a more profound sense of what it means to be a citizen of a planet where resources and opportunities are provided fairly and equitably?
– Living Building Challenge*

Instructors

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Course Description 3 Credits; 3 Week M-term Summer Seminar/Studio

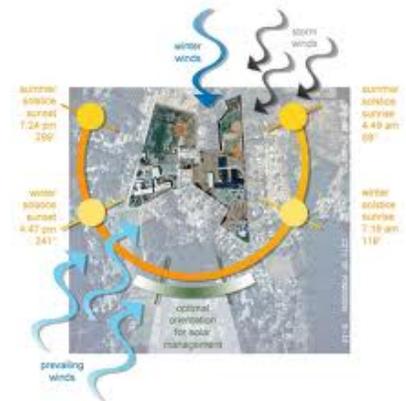
This course will explore the interrelationships of energy, resources, water, and carbon emissions across building, site and regional scales. It is aimed at students seeking to enhance their understanding of integrating ecological design performance metrics and modeling into the design and decision-making process.

Background

The University of Minnesota Twin City Campus is our venue to investigate the strategic integration of carbon, energy, and water management design for new and renovated buildings within the landscape and regional contexts. Funding has been provided by the University Provost from the Ann Salovich bequest to integrate sustainability and to beautify the Campus.

This course is part of a 3-year research and education project intended to foster zero-emission campus design while creating new interdisciplinary educational and research collaborations at the University. The *Zero+ Campus Design Project* is investigating integrated *energy and environmental performance design and modeling* at the building and landscape scales to inform the sustainable design and decision-making process at the University of Minnesota’s Twin Cities Campus. This interdisciplinary collaborative effort brings together the Department of Landscape Architecture, School of Architecture, the Institute on the Environment, and UMN Capital Planning and Project Management, and Energy Management as well as other interested disciplines.

While the practice of modeling the energy performance of buildings is well established and integrated into the design of all new buildings at the University of Minnesota, performance modeling of environmental factors (stormwater, biodiversity, shade and ground cover, energy use in the landscape, and other criteria) are not considered or integrated into the creation of the building energy design and modeling. These environmental factors play a significant role in the actualized performance of the campus, and also contribute to the beauty of place. The *Zero+ Campus Design Project* will explore how to integrate the modeling and design of buildings into the campus landscape.



Objectives

The primary goal of this course is to conceive of integrated building and landscape design solutions and interventions that can move the University toward a zero emissions, zero-energy, zero water, zero runoff, and zero-waste campus through creative integrated and interdisciplinary approaches to design. Therefore the course seeks to:

1. Establish a clear vision for Zero+ Campus Design – what is it, and how will it be different from the campus of today?
2. Approach the problem using an interdisciplinary process which integrates ecological scales and issues (e.g., energy, water, wastewater treatment, materials, pollution, habitat, biodiversity, etc.).
3. Use hands-on fieldwork, case study analyses, and design investigations to explore and apply sustainable design concepts, principles, and strategies in creating design proposals that respond to the goals of net-zero energy, water and resource use in buildings.

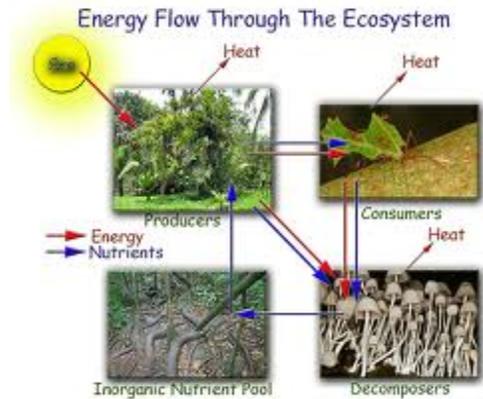
Exercises

Tentative exercise weighting:

- *Exercise 1: Envisioning the Net-Zero+ Campus*
Evaluating building vs. site vs. regional scales 30%
- *Exercise 2: Re-framing the Ecological Campus*
Inter-relationships of carbon, energy, water, runoff and waste 30%
- *Exercise 3: Vision for an Integrated Net-Zero+ Campus* 40%
- Total:** 100%

Deliverables

Student teams will investigate the ecological opportunities of integrated zero carbon emissions, zero-energy, zero-water and zero-waste design focusing on a specific building or group of buildings within a select precinct on campus. The primary deliverables will be an assessment of energy, water and resource flows and relationships (one week) and a final collaborative design project (two weeks) consisting of the following:



- Develop integrated building/landscape designs proposals that improve the ecological design performance and beautify the campus by the strategic integration of high performance and sustainable building design features and landscape interventions such as the placement of trees, green roofs, living walls, and rain gardens on campus.
- Develop integrated concepts and strategies for reduction of:
 - Energy, water and resource consumption and waste generation.
 - Stormwater runoff and its associated mitigation of pollution, flooding, and energy consumption.
 - Urban heat island effect and related threats to human and ecological health.

Eligibility

This course is open to all M. Arch., MLA. and M.S. in Sustainable Design Students. A minimum of 12 and maximum of 24 student participants has been set as the course enrollment.

Prerequisites

There are no prerequisites for this class. Students will need design and analysis skills and an interest in sustainable design. Some knowledge of computer building performance analysis is preferred but not required (e.g., Ecotect, Energy 10, HydroCAD, GIS and BIM tools, etc.).

Teaching Format

The 3-week, 3-credit course will meet in class for 18 hours per week, including the following: 1) two 6-hour lecture/studio sessions per week, 2) one 6-hour field study and/or 3) one 4-6-hour review per week. Students will work collaboratively in interdisciplinary teams.

Grading Standards

University of Minnesota Grading Standards:

- A Achievement that is outstanding relative to the level necessary to meet course requirements
- B Achievement that is significantly above the level necessary to meet course requirements
- C Achievement that meets the course requirements in every respect
- D Achievement that is worthy of credit even though it fails to meet fully the course requirements
- SAchievement that is satisfactory, which is equivalent to a C- or better
- F (or N) Represents failure (or no credit) and signifies that the work was either: 1) completed but at a level of achievement that is not worthy of credit or 2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an incomplete.
- I (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstance, e.g., hospitalization, a student Is prevented from completing the work of the course on time. Requires a written agreement between instructor and student.

- Academic Dishonesty** Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.
- Credit/Workload** This 3 credit course will run for 3 weeks. The expected workload for this course, based on University standards, is an estimated total of 24-30 hours per week. This can include any combination of time in the class or outside the class. We will work with students to assess the workload and make adjustments as needed.
- Schedule and Attendance** The course meets daily on Monday-Thursday afternoons in a room or field study location (time and locations to be announced). Attendance is required. It is critical that you fully participate and attend all activities (lectures, discussions, and field studies). Please make every effort to be on time.
- Reading** Specific readings will be assigned with the individual course assignments in one week blocks. All readings will be on *electronic reserve* available through the University of Minnesota library system. Selected readings will be provided through e-reserve:
- Center for Ecoliteracy, "Systems Thinking," <http://www.ecoliteracy.org/education/systems-thinking.html>.
 - Condon, [Urban Planning Tools for Climate Change Mitigation](#).
 - Gaffin, Dr. Stuart, et. al. "Quantifying Evaporative Cooling from Green Roofs and Comparison to Other Land Surfaces." Center for Climate Systems Research, Annual Greening Rooftops for Sustainable Communities Conference Proceedings: 2006.
 - Guzowski, Mary. *Towards Zero Energy Architecture*. New York: Lawrence King Publ., 2010 (selected readings).
 - Living Building Challenge V2.0, <http://ilbi.org/the-standard/version-2-0>.
 - Holmgren, David. *Permaculture, Principles & Pathways Beyond Sustainability*,
 - Principle 1, "Observe and Interact" pp-13-20 and Principle 7: "Design from Patterns to Details" pp-127-130. Victoria, Australia, Holmgren Design Services, 2002.
 - Orr, David W., *The Nature of Design, Ecology, Culture and Human Intention*, Oxford University Press, 2002 (selected).
 - [Planetizen: the urban dimension to climate change](#)
 - Principle 1, "Observe and Interact" pp-13-20 and Principle 7: "Design from Patterns to Details" pp-127-130. Victoria, Australia, Holmgren Design Services, 2002.
 - Reed, Bill. "The Trajectory of Environmental Design, *Integrative Design* http://www.integrativedesign.net/files/u1/Trajectory_EnvironmentallyResponsibleDesign.pdf, pp. 1-10
 - Sustainable Sites Initiative Guidelines, ASLA (2008).
 - Wigginton, Michael and Jude Harris. *Intelligent Skins*, Oxford: Butterworth-Heinemann, 2002 (selected).

POLICY STATEMENTS

- Subject to Change** With the exception of the grade and attendance policies, parts of this syllabus are subject to change with advance notice, as deemed appropriate by the instructors.
- Students with Disabilities** This syllabus can be made available in alternative formats upon request. Contact the School of Architecture 612.624.7866. Students with Disabilities that affect their ability to participate fully in class or meet all course requirements are encouraged to bring this to the attention of the instructor so that appropriate accommodations can be arranged. Further information is available from Disability Services (16 Johnson Hall).

- Scholastic Conduct** All students are responsible for conduct in conformance with the University of Minnesota Student Conduct Code which, among other provisions, broadly defines scholastic misconduct as “any act that violates the rights of another student in academic work or that involves misrepresentation of your own work.”
- Intellectual Property** The College of Design has the right to retain any student project whether it be for display, accreditation, archive, documentation or any other educational or legal purpose. In addition, the College reserves the right to reproduce and publish images of any such student work in collegiate publications, printed or electronic, for the purposes of research, scholarship, teaching, publicity and outreach, giving publication credit to the creator/student.
- Academic Policies** Academic policies for this course (including but not limited to: accommodations for students with disabilities, statements on classroom conduct, and statements regarding sexual harassment, and academic integrity) can be found in the University’s website at <http://www1.umn.edu/usenate/usen/usenpol.html>. Classroom misconduct, violation of academic integrity, sexual harassment and issues concerning students with disabilities should be reported to the Director of College of Design Student Services and to the Department Head.

TENTATIVE COURSE SCHEDULE

Week
1

ENVISIONING THE NET-ZERO CAMPUS

- Mon 05 23 Introduction: Envisioning the Net-zero campus/introducing the problem
- Tue 05 24 Lecture: Energy and water flows and relationships and Precedent Research and case study development
- Wed 05 25 Work session and Field Study: To Be Determined
- Thu 05 26 Work session and project review - Due Exercise 1

Week
2

REFRAMING THE ECOLOGICAL CAMPUS

- Mon 05 30 Modeling Performance across scale and across the building-landscape boundary
- Tue 05 31 Work session and Field Study: St. Paul Fire Station 1 Green Roof Interpretive Center and Garden Classroom, St. Paul, MN.
- Wed 06 01 Guest Lecture: To be announced
- Thu 06 02 Work period and desk crits – Due Exercise 2

Week
3

VISION FOR AN INTEGRATED NET-ZERO CAMPUS

- Mon 06 06 Building and Landscape Integration and analysis
- Tue 06 07 Work period and model troubleshooting
- Wed 06 08 Work period and small group pin-ups
- Thu 06 09 FORMAL REVIEW: Final Integrated Design – Due Exercise 3