Winter 2024 – ARCH 126: Environmental Building Design

Course Information

Times and Locations

Wednesdays 9:30am-12:30pm – ARC 1101 (e-classroom) or on Teams when required by COVID-19 mandates

Instructors:

Anna Beznogova – abeznogova@uwaterloo.ca

Office hours: As needed – generally available before and after class, or virtually on Teams by appointment in the evenings.

When to contact: Contact ANNA if you need special accommodations or have questions about the assignments that are not addressed in the assignment or class outlines. Also get in touch if you'd like to request a meeting/office hours to discuss course content.

TAs:

Alia Abdelghaffar – aabdelghaffar@uwaterloo.ca

Inam Zehra Rizvi – izrizvi@uwaterloo.ca

Office hours: Generally available in masters studios 12:30pm-2pm on Wednesdays after Arch 126. Room 3011 for Inam. Room # TBC for Alia.

When to contact: You can't find something in Teams or LEARN, are having an issue figuring out how something works in Teams or LEARN. General and technical questions about the assignments. Help with understanding the course content. **Please make sure you look for the answer in the outline before asking your question!**

Important:

Please email to confirm that you are looking to meet during office hours to make sure that your instructor / TAs will be available as planned. Hours above are a general guideline.

Territorial Acknowledgement

We acknowledge that the School of Architecture is located on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. The University is situated on the Haldimand Tract, the land promised to the Six Nations that includes 10 kilometres on each side of the Grand River. (see references here: https://uwaterloo.ca/engineering/about/territorial-acknowledgement)

Course Description

An introduction to environmental design practices leading to low carbon design. Topics of discussion include passive heating and cooling, solar geometry, climate and meteorological influences, microclimate, site design, daylighting, active systems, embodied energy, sustainable rating systems, sustainable design philosophies such as cradle to cradle, biomimicry and design for disassembly. Energy-related issues will be addressed and energy-based software design programs will be introduced. Understanding the role of design in an energy efficient or passive solar building will be a central learning outcome.

Learning Objectives

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

- Describe the development of environmental building design from green buildings to regenerative design
- Understand how issues of environmental sustainability, social justice, and individual quality of life are interconnected
- Understand how the making of buildings affects each of these spheres locally and globally, and how design of the built environment shapes culture, as a manifestation of a particular philosophy or worldview
- Understand how sustainable design can form the basis of a design philosophy as opposed to being an “add on”
- Describe how buildings fit into carbon, energy, and water systems, and therefore how design can address larger issues faced in these systems, or make them worse
- Understand the basic principles used in the appropriate selection and application of architectural materials as it relates to fundamental performance, aesthetics, durability, energy, resources, and environmental impact.
- Summarize the differences between several sustainable rating systems, their strengths and weaknesses
- Demonstrate an understanding of the basic principles of building envelope design and associated assemblies relative to their fundamental performance, aesthetics, durability, energy, material resources, and environmental impact. Correctly place control layers and justify material choices.
- Understand local climate and climate threats, and apply the appropriate principles of sustainable design and green building to a small building design project
- Design a small building with a holistic set of environmental building design parameters with the aspiration of a net-zero-impact design. Diagram all basic electrical and mechanical systems necessary in such a building.
- Incorporate passive strategies for reducing energy use into design projects.

Suggested Text

Norbert Lechner – Heating, Cooling, Lighting; any edition

You may find this reference text to be useful as a supplementary resource for the topics covered in class, but it's not required. There will be a copy in Course Reserves.

Other readings will be distributed through LEARN or be available through Course Reserves.

Course Requirements and Assessment

You will be graded on your class notes, personal writing, an essay, a "building catalog" assignment, and a final design project.

- Class notes – 12 x 1.5% = 15% (2 worst note grades will be dropped – 10 will count towards grade) – due at 10pm the evening of each lecture on LEARN
- Reflective Writing Assignment 1 – 8%
- Reflective Writing Assignment 1 Presentations – 2% (3 mins to share your reflection)
- Reflective Writing Assignment 2 – 8%
- Reflective Writing Assignment 2 Presentations – 2% (3 mins to share your reflection)
- Building Case Study – 20% total
    - Case study outline (5%) - project selection + annotated bibliography
    - Plus final essay (15%) – technical writing
- Building Catalogue / Final Project Siting – 10%
- Final Design Project – 35%

Comprehensive descriptions of the deliverables for the assignments (including detailed evaluation criteria, submission procedures, etc.) will be shared in another document when the assignments are formally issued.

Topics & Schedule

Week	Date	Topic	Assessment
1	**Jan 10, 2024**	**Lecture 1: Sustainability framework** – **Topics:** Defining sustainable / environmental building design, commons, environmental psychology, biophilic design, biomimicry – In-class activity / open ended personal question-reflection on human-to-environment relationships	
		Reading – Felix Guattari "The Three Ecologies" – "Chapter 10: Children and the Natural Environment" from Environmental Psychology, ed. Steg and de Groot – Biomimicry toolbox: https://toolbox.biomimicry.org/introduction/ – 14 Patterns of Biophilic Design: https://www.terrapinbrightgreen.com/reports/14-patterns/	
		Optional resources	

		– ILFI Biophilic Design Guidebook: https://living-future.org/wp-content/uploads/2019/01/18-0605_Biophilic-Design-Guidebook.pdf	
2	**Jan 17, 2024**	**Lecture 2: Reading and Discussion Activities on the Commons** – **Topics:** Understanding and discussing the concept of the commons. – In-class activity on shared resources and responsible stewardship	
	Due: Week 3 (Jan 24)	**Reflective Writing Assignment 1 Introduction**	**8% of final grade**
		Reading – "Traditional Anishinaabe Teaching About Plants" from Plants Have So Much To Give Us, All We Have To Do Is Ask by Mary Siisip Geniusz – "Remember Like We Do" from Indigenous Toronto. Edited by Bolduc et al – "Feminism and the Politics of the Commons in an Era of Primitive Accumulation" from Re-Enchanting the World by Silvia Federici	
3	**Jan 24, 2024**	**Lecture 3: Buildings and Material System / part 1** – **Topics:** Buildings and the material system, aspects of sustainability related to material selection, definition of embodied carbon and energy	
		Reflective Writing Assignment 1 Due	
	Due: Week 9 (Mar 13)	**Building Catalogue / Final Project Siting Introduction**	**10% of final grade**
		Reading – Addis and Gorgolewski selections to aid in assignment	
		Optional resources – Cradle to Cradle: https://mcdonough.com/cradle-to-cradle/ – Cradle to Cradle products: https://mbdc.com/how-to-get-your-product-cradle-to-cradle-certified/ – Design for Disassembly guide: https://kingcounty.gov/~/media/depts/dnrp/solid-waste/green-building/documents/Design_for_Disassembly-guide.ashx?la=en – Carbon Crackdown: https://www.architecturalrecord.com/articles/14489-continuing-education-carbon-crackdown	
4	**Jan 31, 2024**	**Lecture 4: Buildings and Material System / part 2** – **Topics:** Continuation of material life cycles and building life cycle considerations for sustainability – Discussion and questions about Building Catalogue **assignment**	
		Reading – CaGBC Zero Carbon Building Standard - https://www.cagbc.org/CAGBC/Zero_Carbon/The_CaGBC_Zero_Carbon_Building_Program.aspx	
5	**Feb 7, 2024**	**Lecture 5: Introduction to LCA** – **Topics:** Concepts and methods for life-cycle assessment in more detail. A look at some key findings.	
	In class	**Reflective Writing Assignment 1 Presentations**	**2% of final grade**

	Due: Week 6 (Feb 14)	**Reflective Writing Assignment 2 Introduction**	**8% of final grade**
		Reading – Chapter 1 from Life Cycle Assessment: Quantitative Approaches for Decisions that Matter, Matthews et al – "National guidelines for whole-building life-cycle assessment", Matthew et al	
6	**Feb 14, 2024**	**Lecture 6: Green Building Certification Systems** – **Topics:** Key aspects of LEED, Living Building Challenge, Passive House	
		Reflective Writing Assignment 2 Due	
	Due: Week 7 (Feb 28)	**Case Study – Annotated Bibliography Introduction**	**5% of final grade**
	Due: Week 11 (Mar 27)	**Case Study – Essay Introduction**	**15% of final grade**
		Reading – LEED Credit Category Overviews: https://www.usgbc.org/guide/bdc#credit – Living Building Challenge Basics: https://living-future.org/lbc/basics4-0/ – LBC Petal Overviews: https://living-future.org/lbc/ (scroll down to "Petals")	
		Optional Resources – LEED Credit Library: https://www.usgbc.org/credits?Version=%22v4.1%22&Rating+System=%22New+Construction%22 – LEED Scorecard: https://build.usgbc.org/bdc41scorecard – LEED v4.1 homepage: https://www.usgbc.org/leed/v41 – Getting started with LEED BD+C: https://www.usgbc.org/articles/getting-started-leed-building-design-and-construction – Living Building Challenge: https://living-future.org/lbc/ – Passive House: https://www.passivehousecanada.com/passive-house-resources/ – Passive House in 90 seconds: https://www.youtube.com/watch?v=CasrjYhZB1M	
		Reading Week Feb 17 – Feb 25 2024	
7	**Feb 28, 2024**	**Lecture 7: Reading Activity / spillover class**	
		Case Study – Annotated Bibliography Due	
	In class	**Reflective Writing Assignment 2 Presentations**	**2% of final grade**
		Reading – **Will be shared digitally prior to class.**	
8	**Mar 6, 2024**	**Lecture 8: Building and the energy system / passive systems** – **Topics:** Buildings and the energy system, passive strategies for energy use reduction	

		Reading – Review Lechner Chapters 7, 9, 10, 11, 13	
9	**Mar 13, 2024**	**Lecture 9: Building and the energy system / active systems** – **Topics:** Active building technologies that reduce energy use	
		Building Catalogue / Final Project Siting Due	
		Reading – Review Lechner Chapters 8, 14, 16	
10	**Mar 20, 2024**	**Lecture 10: Buildings and the water system** – **Topics:** Natural hydrology, site design, LID, indoor and outdoor water use reduction strategies	
	Due: April 19	**Final project – Urban Oasis Introduction**	**35% of final grade**
11	**Mar 27, 2024**	**Lecture 11: Human health** – **Topics:** Low-emitting materials, public health as a design driver, human experience, evidence-based design	
		Case Study – Essay Due	
		Optional resources – Declare – Red List – Precautionary List – HPD Repository – LEED LEM credit and calculator – Certifications accepted for LEED LEM – WELL – Fitwel	
12	**Apr 3, 2024**	**Lecture 12: Resilient design** – **Topics:** Climatic resilience / resilient building design, personal resilience – Opportunity for final project discussion and questions – Office hours scheduling	
		Optional resources – Climate Atlas – RELi v2.0	
		Exam Period Apr 11 – Apr 25 2024	

Course Delivery Platforms & Communication

To organize materials and communication outside of weekly in-person sessions, we will use the following:

LEARN – Official communication, work submission, and grade recording and release.

MS TEAMS – Used for supplementary discussions outside of in-person class time. Students will be added to the course team in the first week of class. Teams will also be used for sign-up sheets when needed, and for organizing course documents such as readings.

Course Policies

COVID-19. Given the continuously evolving situation around COVID-19, students are to refer to the University of Waterloo's developing information resource page (https://uwaterloo.ca/coronavirus/) for up-to-date information on academic updates, health services, important dates, co-op, accommodation rules and other university level responses to COVID-19.

Continuity Plan - Fair Contingencies for Unforeseen Circumstances (e.g., resurgence of Covid). In the event of emergencies or highly unusual circumstances, the instructor will collaborate with the Department/Faculty to find reasonable and fair solutions that respect rights and workloads of students, staff, and faculty. This may include modifying content delivery, course topics and/or assessments and/or weight and/or deadlines with due and fair notice to students. Substantial changes after the first week of classes require the approval of the Associate Dean, Undergraduate Studies.

Late Work: Assignments that are handed in late will receive an initial penalty of 5% on the first calendar day late and a 5% penalty per calendar day thereafter. After 5 calendar days, the assignment will receive a 0%.

Failure to participate in Reflective Writing Presentations will result in a grade of 0%. Not submitting the Reflections on time will make it difficult to participate in the Presentations.

Only in the case of a justified medical or personal reason will these penalties be waived, and only if these have been officially submitted to the Undergraduate Student Services Co-Ordinator and accepted by the Undergraduate Office.

Students seeking accommodations due to COVID-19, are to follow Covid-19-related accommodations as outlined by the university here: (https://uwaterloo.ca/coronavirus/academic-information#accommodations).

Late Pass Policy: Students are allocated **one** late pass for the term. This allows students to make **one** submission up to **24 hours** after the stated deadline without penalty and without any request for accommodation. Students are required to **communicate** with your instructor their intention to use a late pass **before the relevant deadline**. A Late Pass **cannot be used for the Reflective Writing Presentations or the Final Design Project.**

Declaring absences (undergraduate students and/or courses only): Regardless of the process used to declare an absence, students are responsible for reaching out to their instructors as soon as possible. The course instructor will determine how missed course components are accommodated. Self-declared absences (for COVID-19 and short-term absences up to 2 days) must be submitted through Quest. Absences requiring documentation (e.g., Verification of Illness Form, bereavement, etc.) are to be uploaded by completing the form on the VIF System. The UW Verification of Illness form, completed by a health professional, is the only acceptable documentation for an absence due to illness. Do not send documentation to your advisor, course instructor, teaching assistant, or lab coordinator. Submission through the VIF System, once approved, will notify your instructors of your absence.

Passing Grades: The standard minimum passing grade in each ARCH course is 50% with the following exceptions: the minimum passing grade is 60% for all studio courses (ARCH 192, ARCH 193, ARCH 292, ARCH 293, ARCH 392, ARCH 393, ARCH 492, and ARCH 493). Grades below the specified passing grade result in a course failure.

CACB Student Performance Criteria: The BAS/MArch program enables students to achieve the accreditation standards set by the Canadian Architectural Certification Board as described here. This course addresses the CACB criteria and standards that are noted on the Accreditation page of the School of Architecture website.

Use of GenAI. This course includes the independent development and practice of specific skills, such as **reflective and technical writing, and original architectural design.** Therefore, the use of Generative artificial intelligence (GenAI) trained using large language models (LLM) or other methods to produce text, images, music, or code, like Chat GPT, DALL-E, or GitHub CoPilot, is not permitted in this class. Unauthorized use in this course, such as running course materials through GenAI or using GenAI to complete a course assessment is considered a violation of Policy 71 (plagiarism or unauthorized aids or assistance). Work produced with the assistance of AI tools does not represent the author's original work and is therefore in violation of the fundamental values of academic integrity including honesty, trust, respect, fairness, responsibility and courage (ICAI, n.d.).

You should be prepared to show your work. To demonstrate your learning, you should keep your rough notes, including research notes, brainstorming, and drafting notes. You may be asked to submit these notes along with earlier drafts of their work, either through saved drafts or saved versions of a document. If the use of GenAI is suspected where not permitted, you may be asked to meet with your instructor or TA to provide explanations to support the submitted material as being your original work. Through this process, if you have not sufficiently supported your work, academic misconduct allegations may be brought to the Associate Dean.

In addition, you should be aware that the legal/copyright status of generative AI inputs and outputs is unclear. More information is available from the Copyright Advisory Committee: https://uwaterloo.ca/copyright-at-waterloo/teaching/generative-artificial-intelligence

Students are encouraged to reach out to campus supports if they need help with their coursework including:

- Student Success Office for help with skills like notetaking and time management
- Writing and Communication Centre for assignments with writing or presentations
- AccessAbility Services for documented accommodations
- Library for research-based assignments

Mental Health Support

If you are facing challenges impacting one or more courses, contact your academic advisor, Associate Chair Undergraduate, or the Director of your academic program. Mental health is a serious issue for everyone and can affect your ability to do your best work. We encourage you to seek out mental health supports when they are needed. Please reach out to Campus Wellness (https://uwaterloo.ca/campus-wellness/) and Counselling Services (https://uwaterloo.ca/campus-wellness/counselling-services). Counselling Services is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

We understand that these circumstances can be troubling, and you may need to speak with someone for emotional support. Good2Talk (https://good2talk.ca/) is a post-secondary student helpline based in Ontario, Canada that is available to all students.

Equity, Diversity and Inclusion Commitment

The School of Architecture is committed to foster and support equity, diversity and inclusion. If you experience discrimination, micro-aggression, or other forms of racism, sexism, discrimination against 2SLGBTQ+, or disability, there are several pathways available for addressing this:

A) If you feel comfortable bringing this up directly with the faculty, staff or student who has said or done something offensive, we invite you, or a friend, to speak directly with this person. People make mistakes and dealing them directly in the present may be the most effective means of addressing the issue.

B) you can reach out to either the Undergraduate office, Graduate office, or Director. If you contact any of these people in confidence, they are bound to preserve your anonymity and follow up on your report.

C) You can choose to report centrally to the Equity Office. The Equity Office can be reached by emailing equity@uwaterloo.ca. More information on the functions and services of the equity office can be found here: https://uwaterloo.ca/human-rights-equity-inclusion/about/equity-office.

D) Racial Advocacy for Inclusion, Solidarity and Equity (RAISE) is a student-led Waterloo Undergraduate Student Association (WUSA) service launching in the Winter 2019 term. RAISE serves to address racism and xenophobia on the University of Waterloo campus with initiatives reflective of RAISE's three pillars of Education and Advocacy, Peer-to-Peer Support, and Community Building. The initiatives include but are not limited to: formal means to report and confront racism, accessible and considerate peer-support, and organization of social events to cultivate both an uplifting and united community. You can report an incident using their online form.

Religious & Spiritual Observances: The University of Waterloo has a duty to accommodate religious and spiritual observances under the Ontario Human Rights Code. Please inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments. Consult with your instructor(s) within two weeks of the announcement of the due date for which accommodation is being sought.

Respectful Communication and Pronouns. Communications with Instructor(s) and TAs should be through recommended channels for the course (e.g., email, LEARN, Piazza, Teams, etc.) Please use your UW email address. Include an academic signature with your full name, program, student ID. We encourage you to include your pronouns to facilitate respectful communication (e.g., he/him; she/her; they/them). You can update your chosen/preferred name at WatIAM. You can update your pronouns in Quest.

Intellectual Property

Be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof).
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides).
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights and academic integrity.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online.

Academic integrity, grievance, discipline, appeals and note for students with disabilities:

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

Note for students with disabilities: AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit the alternate assignment.