ENV335 H1-F – Environmental Design

I CONTACTS

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II COURSE OVERVIEW

LOCATIONS:
Physical meeting location: GB 220
Digital meeting location: Microsoft Teams (Link to be shared via Quercus)

MEETING TIMES:
In person and/or synchronous online sessions - Mondays: 13:00 – 16:00 ET

* The class meetings will be recorded and uploaded to Quercus in the same day.

COURSE DESCRIPTION:
Environmental design, in the context of this course, refers to design strategies that account for the ability of supporting ecosystems to continue to meet human needs and those other lifeforms without diminishing biological diversity or environmental quality. This course takes a hands-on approach to investigating several environmental issues specific to architectural design: climate-responsive design, energy consumption, health and comfort, natural lighting, natural ventilation, mechanical HVAC systems, and on-site renewable energy generation. The Environmental Design course will expand upon these concepts through lectures, case studies, and hands-on activities in class. By the end of the term, students will propose a design of a net-zero energy/carbon residential building.

STUDENT LEARNING OUTCOMES:
By the end of this course, a successful learner will be able to do the following:

1. Understand the impacts of architectural design on operational and embedded energy.
2. Predict and describe the impacts of architectural design on energy consumption and human health and comfort.

3. Analyze a subset of environmental design issues in architecture based on measured data, mathematical estimations, or physically-based performance simulations.
4. Make recommendations towards the design of a net-zero energy (or carbon) housing development based upon novel analysis (group analysis project).

PREREQUISITE COURSE(S):
This course assumes you have completed 8.0 FCE including ENV221H1/ENV222H1 or have permission of the Undergraduate Associate Director.

III HOW THE COURSE IS ORGANIZED

Weekly class meetings are divided between slide lectures, case studies and hands-on exercises/tutorials. All the class meetings will be recorded and uploaded to Quercus in the same day. Participation in the course requires the submission of four homework activities, and a final analysis project.
Attendance will be taken during each class period. If you are not able to attend a weekly session due to illness or otherwise, please fill out the self-declaration form on ACORN.

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

Date	Topic	Activities & Assignments
January 10th	Course introduction Architectural goals: comfort, energy, productivity, and program	Activity Overview of upcoming activities / Evaluating the comfort of our classroom compared to measurements
January 17th	Toronto climate analysis Definition of net-zero / environmental/high performance building: energy, carbon, site, and source	Activity Using 'Climate Consultant' with different climate file data sources Assignment HW#1 – Climate Comparison (Out)
January 24th	Solar architecture Case studies	Activity Learning Sun-path
January 31st	Shading Design Case Studies	Activity Simple geometric shading design calculations Assignment HW#1 – Climate Comparison (Due) HW#2 – Shading design (Out)
February 7th	Solar design considerations *Guest Lecturer: Ryan Danks, RWDI* Introduction to daylighting and electric lighting systems	Activity Daylight factor estimations and benchmarking for the Toronto climate
February 14th	Daylighting estimations Outdoor and indoor thermal comfort *Guest Lecturer: Duncan Phillips, RWDI*	Activity CBE Thermal Comfort Tool Assignment HW#2 – Shading design (Due) HW#3 – Climate-based daylight estimations (Out)
February 21st	Family Day – NO CLASS	

Date	Topic	Activities & Assignments
February 28th	Building heat balance and introduction to heat transfer Envelope design: Conduction, Convection and Radiation	Activity Conductive, Convective, and radiative heat transfer calculations
March 7th	External and internal thermal loads *Guest Lecturer: Chris Raghubar, RWDI*	Activity Learning about various building energy simulation tools, types and capabilities Assignment HW#3 – Climate-based daylight estimations (Due)
March 14th	Thermal simulations, beyond the steady state	Activity Spreadsheet thermal simulation tool Assignment HW#4 – Dynamic energy simulations in spreadsheet (Out)
March 21st	Natural ventilation Stack Effect *Guest Lecturer: Duncan Phillips, RWDI*	Activity Coolvent thermal and natural ventilation combined simulations
March 28th	HVAC systems, removing and adding heat and humidity	Activity Learning the psychrometic chart Assignment HW#4 – Dynamic energy simulations in spreadsheet (Due)
April 4th	Renewable energy sources Embedded carbon vs. operational energy	Activity NREL's PVWatts calculator tool and back of the envelope PV calculations Discussion of Final Project Submission, review of former assignments.
Final project report submission is due on the last day of the final assessment period.		

WEEKLY ACTIVITY OBJECTIVES:
The weekly activities (see course schedule) are intended to build novice skills in building performance analysis. They should also enable students to assess and interpret building performance information that may be generated by themselves, found in periodicals or on the internet, or that are generated by professionals. Understanding of the tools and methods taught during the weekly activities will be critical for completing the homework assignments and doing well on the course final analysis project.

IV EVALUATION/GRADING SCHEME

See the course schedule for homework assignment and midterm quiz timing. Assignments will be due on Fridays at 11:55 pm during the weeks indicated.

The final analysis project will be due on the last day of the final assessment period.

MARK BREAKDOWN

- In-class participation (10%);
- 4 assignments (60%); each 15%
- Final analysis project (30%)

CRITERIA FOR EVALUATING WORK
The primary criteria used in evaluating assignments and the analysis project will be disseminated during the course on a per-assignment basis.

V COURSE POLICIES

- This statement from the university is of utmost importance: "*The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities*."

- All assignments are due at the specified time and date. Late submission will result in a 10% deduction (of each assignment's total grade) per day.

- Attendance will be taken using a short Quercus quiz during each class period. If you are not able to attend a synchronous session due to illness or otherwise, please fill out the self-declaration form on ACORN. We will not be

requiring verification of illness this term.

- Students who for reasons beyond their control are unable to submit an assignment by its deadline must obtain approval from their instructor for an extension within the term.

- All assignment submissions will take place through Quercus.

VI TECHNOLOGY REQUIREMENTS

Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/

Advice for students more broadly regarding online learning is available here: https://onlinelearning.utoronto.ca/getting-ready-for-online/

This course requires the use of computers, and of course sometimes things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for a deadline extension.

VII INSTITUTIONAL POLICIES AND SUPPORT

ACADEMIC INTEGRITY

On Academic Integrity:
Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see https://www.academicintegrity.utoronto.ca/).

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ACCESSIBILITY NEEDS

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact Accessibility Services as soon as possible.

ADDITIONAL SERVICES and SUPPORT

The following are some important links to help you with academic and/or technical service and support

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information for Technical Support/Quercus Support