ARCH 364 –: Building Science

Winter 2021

"How to make buildings that work" or "*How to practise architecture and not get sued"*

This course develops an understanding of scientific principles, as well as economic, technical, and practical factors that influence *good design for physical performance* (durability, health, safety, resource and energy efficiency) & thus sustainability of building. Principles of siting, shape, orientation and enclosure design from earlier courses will be briefly reviewed to allow for integration. An awareness of the interaction of HVAC, lighting, and other technical factors within the overall building design process to meet a range of goals will be integrated

Learning Objectives

At the end of the course students will be able to

- define the functions of the building enclosure and its constituent parts.
- calculate the thermal resistance of building assemblies, and identify thermal bridges
- explain the principles of good building science: primarily an understanding of the science behind the management of rain penetration, air leakage, the flow of heat (solar and temperature difference), and control condensation
- develop enclosure schedules including functional requirements
- provide the proper information on building enclosure drawings for schematic concept design (SD), design development (DD) and construction documents (CD)
- apply the principles of building science to the detailing of common building enclosure intersections

Scope & Approach

The bulk of the course will focus on Canadian multi-unit residential, commercial/institutional buildings designed by architects but different climate zones (such as hot-humid), and single-family will be mentioned.

Common building enclosure assembly materials and designs will be explored through case studies of famous, local, unique, and vernacular building materials, details, sections, etc. both successful and failures.

The course's focus is on the needs of the professional architect, i.e., those involved in the design, rehabilitation, construction and operational aspects of buildings and the building enclosure i.e., walls, windows, roofs, foundations etc.

Instructor:

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(preferred method, not Teams chat or text messages)
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Teaching Assistant

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Lectures

Wednesday: 9:00 to 11:50 PM using MS Teams

If you have internet connection issues remember that a phone-in number is also available and you should use this to attend if needed. Lectures will be recorded and in most cases pdf files will be posted just before class, so you can download and follow along.

Deliverables and Assessment

Marks will be assigned through:

- weekly quizzes / exercises (about ten for a total of 20%)
- Assignments (4 @ 10% =40%)
- enclosure detailing of your studio project (20%), and
- a 2.5 hour final exam (20%).

A short ***on-line quiz*** (LEARN) will be assigned after most lectures to confirm both attendance and comprehension and help keep everyone up to date… this will need to be completed within a window that will open Wednesday at 6 PM and closes Friday at 6 PM

Assignments are all to be submitted into the LEARN Dropbox on the course site. They are due 2 PM Wednesday to avoid conflicts with 342 (and hence late penalties it will be strictly enforced). All assignments must be submitted in a single bundled file pdf form with a separate cover page with the students' full name, ID#, and ARCH 364-2021 clearly written or typed. One warning will be issued, after which the assignment will have 25% removed.

The ***final project*** will be handed in on the last day of classes (Apr 14, at 10 PM) and aims to integrate the term's studio project. It will be assigned in the final month. The final exam has not yet been scheduled – please coordinate with the front office as to when this is set.

Reference Materials and Texts

Required textbook *High Performance Building Enclosures*, by John Straube, Building Science Press, Somerville, MA, 2012. 978-0-9837953-9-1: PDF excerpts will be provided on LEARN this term. It is assumed that you have taken the ARCH building technology courses and hence have a copy of, and understand, *Fundamentals of Building Construction*, by Ed Allen (any edition) e.g. Wiley, 2013, ISBN 0471219037 or newer.

Extensive Web notes (via the Learn site) will be provided. Required (tested and discussed in class) readings will be assigned in class and posted to Learn in a folder identified as such.

Remote Course Delivery Platforms & Communication

During remote learning, Arch 364 will be using additional software platforms to deliver, organize and share course content, learning and work. The course will use pre-recorded slide shows/videos (posted or linked from LEARN), synchronous lectures, and live/text Q&A (both delivered via MS Teams. Live lectures will be recorded and posted for students who may not be able to attend live.

The level of effort, including attending classes and assigned reading is an average of 6 hrs per week. Some weeks will be less (as little as 3 hrs), and those weeks with assignments due will be more (and hence work on assignments should start *at least a week* before the due date).

Course Time Zone

All dates and times are expressed in Eastern Time (Local time in Waterloo Ontario, Canada).

Student Notice of Recording

The course's official Notice of Recording document is found on the course's LEARN site. This document outlines shared responsibilities for instructors and students around issues of privacy and security. Each student is responsible for reviewing this document.

Fall 2020 COVID-19 Special Statement

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.

Late submissions:

No projects will be accepted past the final exam period, and will be assigned a mark of zero, i.e. a course failure, without a doctor's note. In term projects will have marks deducted for late submission at the rate of 20% of total grade per day.
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).

Rules and Regulations

Late Policy. Assignments will lose 20% of possible marks if late and 10% per day for each additional calendar day that a project or assignment is late. *All course work must be submitted by the final day of exams in the term in which the course is taken or will be given a mark of zero.*

Missed Quiz/Exam. Student who miss quizzes must have a doctor's note or equivalent. Plan to be present in school during the official final exam period. *Student travel plans are not considered acceptable grounds for granting an alternative examination time*

Academic Integrity and Plagarism: 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. It is the student's responsibility to inform themselves of what constitutes plagrism. Proper references to other peoples work are required, especially when you are presenting work or ideas as your own. Never submit drawings that are based on the digital files of others—components taken from specific manufacturers' websites are acceptable but should be referenced. [Check www.uwaterloo.ca/academicintegrity/ 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, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the School's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity [check www.uwaterloo.ca/academicintegrity/] to avoid committing an academic offence, and to take responsibility for his/her actions. 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, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

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) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 the OPD at the beginning of each academic term.