ARCH 673: THE SCIENCE OF THE BUILDING ENCLOSURE

"Designing buildings that work"

Outline

This course covers the technical aspects of design buildings that work, with a focus on the building enclosure (called the "envelope" in the past). The course advances beyond Arch 364 in depth and scope. The emphasis is on the practical technical needs of architects specifying, designing, and detailing building enclosures -- walls, windows, roofs, foundations etc. Although typical modern Canadian architectural practise is the primary concern, which means cold climate commercial, institutional, and high-rise residential occupancy, building in other climates and contexts (e.g., Dubai, Houston, Shanghai, Las Vegas) will be compared and contrasted. There will be a bias towards buildings with the high performance goals required by new energy regulations and owners seeking low- and net-zero-energy buildings as well as how to choose low-embodied carbon materials. Minimum performance expectations required by codes will be identified however.
The performance of building materials, integration with common structural systems, a review of the benefits and limitations of the different types of enclosures, and the detailing of many common enclosure assemblies are covered. Mechanical environmental devices, including lighting, will be briefly discused alongside daylighting, shade, and ventilation as they relate to the choices made by architects about enclosures. Site design, orientation, and massing as it relates to building performance are briefly reviewed and integrated.

Learning Outcomes

At the end of the course, students should be able to

- explain some of the reasoning behind technology choices made by Canadian architects
- describe common building enclosure materials and systems used in Canada
- identify the important control layers in modern building enclosures
- be able to detail junctions and transitions which ensure control layer continuity
- develop enclosure details for high performance buildings.

Lectures:

Tuesday 9:30 AM to 12:20 PM in CAM ARC1011 **or via MS Teams**

Instructor:

Dr John Straube, P.Eng.
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Telephone: **519 741 7920**
Office hours: to be arranged in class to suit needs

Remote Course Delivery Platforms & Communication

Lectures will be broadcast and recorded using MS Teams. PDF's of the powerpoint presentations will be posted on LEARN, either immediately before or imediately after each lecture. Some group work will be required and short presentations given by students during class time… this will likely be done using the Teams platform to allow sharing with students who may be online.

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.

Textbooks

Readings will be provided on UW-Learn site: the "Course Readings" folder are required reading.
Other references: *High Performance Building Enclosures*, by J Straube, *Architectural Detailing* by Ed Allen all CMHC *Best Practise Guides* (all of these are in the library)

Course Requirements and Assessments

Project #1: 10% P1a 15% P1b Two-part design assignment and presentations.

Participation: 10% Present, prepared, contributes to discussions, answers questions

Project #2: 40% Design project: detail enclosure drawings. Due Dec 7 End of Day.

Exam #1: 25% On-line exam in final exam period. Dec 6-21. Don't schedule travel.

Attendance of the lectures is important and assumed, but it is acceptable to miss a few lectures with good reason.

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 doctors 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).

Projects

Projects will be described in more detail with a specific handout. The first project involves the detail design of a building enclosure for a specific building type-climate-exposure combination. A fine scale drawing must be submitted, identifying layers, arrangement and materials identified, and presented/explained to the class in groups of three or four.
The second project will require the submission of details of numerous prescribed (4) enclosure component intersections of a building. The final project is due Dec 3, in paper form (with electronic as backup). More information will be provided on the final project later in the course.

Course Time Zone

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

Important Fine Print

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. [See www.uwaterloo.ca/academicintegrity/ for more information.] This includes referencing sources of ideas and photos, no copying of others' work, etc.

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 [see 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 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 the OPD at the beginning of each academic term.

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)