Dalhousie University
School of Architecture
ARCH 3208.03
Winter Term 2024

B2 BUILDING TECHNOLOGY

Instructor: Eric Stotts [Eric.Stotts@dal.ca]
Course Assistants: Calie De Joseph [cl915359@dal.ca], Jordan Gallant [tm273148@dal.ca], and Tai Nguyen [tz589640@dal.ca]

Class Times: Tuesday 2:30pm-5:30pm (Room Ind. 220) and Friday 2:30-4:00pm (B015)
Hours/Week: 9 hours/week, including class time.
Brightspace: https://dal.brightspace.com/d2l/home/305958

CALENDAR DESCRIPTION

Credit Hours: 3

This course introduces the students to the design, construction, and environmental performance of wood structures. Building assemblies and construction details are investigated through technical drawings and models – both physical and digital. Students shall be able to successfully incorporate the learned knowledge to their own individual studio projects.

ADDITIONAL COURSE DESCRIPTION

This class introduces key structural, material and environmental principles related to the design and construction of wood buildings. Students will study the unique material qualities of wood and its use as a natural building material. Basic structural principles will be introduced to assist students in utilizing wood members in a systematic way. The requirements of walls will be introduced, and principles such as heat flow, air flow and moisture control in building enclosures will be presented. Construction details, material interfaces and construction sequencing will be studied using drawings and models – both digital and physical. Topical lectures shall complement a series of in-class workshops, quizzes and assignments which will allow students to demonstrate and apply their knowledge of these important architectural principles.
We begin the course studying the ubiquitous construction techniques found in light timber platform and balloon frame construction. This forms a solid base for a broader study of engineered wood, hybrid structural systems and a cursory introduction to mass timber construction. We will also be learning and working with elementary structural principles.

The middle part of the course will cover the basics of building envelope design. In order to mediate between interior and exterior environments, one must understand and design a building's enclosure - or envelope - as a series of layers: thermal insulation, barrier membranes, structure and more. The order in which we layer them up and the ingenuity and skill with which we lead them unbroken through various building junctures is critical to the constructability, performance, durability, and fitness of our buildings for their intended uses. The requirements of walls in buildings will be introduced, focusing on methods for controlling air flow, heat flow and moisture resistance (both vapor and rain) for standard residential and some commercial wall assemblies. Students are expected to have an awareness of the concepts introduced in the course and apply them to their own design projects as our learning progresses.

Throughout the course we will study fundamental aspects of structure, construction and structural analysis, often through an examination of built projects. In a combination of lectures and studio exercises, we will cover principles of statics, structural systems, structural properties of materials, and issues of construction. Lectures shall complement studio exercises and written quizzes.

The course culminates with a series of articulated technical drawings and models that express the structural, architectural, and environmental aspects of your B2 Design project.

CLASS FORMAT
Workshops, lectures, tutorials, quizzes

ASSIGNMENTS - (Please note that additional assignment descriptions will be provided)

1.) Language of Construction - Due February 9, 2024

Models of building assemblies. These are large enough that even small elements like strapping, siding and the various envelope membranes can be made visible. Each student will be part of 10 classwide groups of 6 and will be responsible for building one assembly model, and three mutually perpendicular CAD sectional drawings with a focus on the juncture. The models will be organized in groups (walls, roofs, thresholds, eaves, etc) and each student will model a unique variant. Models will be at a scale of 1:20 and drawings at 1:10.

2.) Structure and Envelope (Aperture) - Due March 15, 2024

Here students will work in groups to study a series of aperture types typically found in buildings. Students will work to develop, design and build a window opening, paying special attention to the sequencing of the various control membrane layers in the assembly, critical junctures and the technical and programmatic requirements associated with the opening. This assignment work will be installed as a class exhibition, and may include guest critics from the architectural and construction industries. Model scale TBD.

3.) Expression of Construction - Due (with Design) – April 5, 2024

These drawings and models should be integrated with and describe your final B2 Design project, whenever a student's design process supports that kind of resolution. Where this is not the case, students may describe an earlier version of their scheme, in consultation with instructor. Building sections, partial sections and framing models shall fully describe each student's building structure and envelope, and shall demonstrate an understanding and application of the principles learned over the course of the term. Scale 1:10, 1:20. See note under

EVALUATION AND ASSIGNMENTS:
evaluated by instructor and T/As, numerical and written feedback

In class assignments and quizzes 20% (individual work)
Language of Construction 30% (15% individual + 15% group)
Structure and Envelope (Aperture) 30% (15% individual + 15% group) TBD
Expression of Construction 20% (20% individual)

Note:
Any Technology work in a final Design presentation should be identified as such, so that it cannot count toward the final Design grade. (This would be a form of "self-plagiarism.") Students cannot submit the same model, drawing, or written work for evaluation in two different courses. You may present and include work from one course in another but this needs to be clearly cited as such. Evaluation criteria will be provided with individual assignments.

COURSE SPECIFIC POLICIES:

Your final letter grade for the course will be based on the Dalhousie University Undergraduate letter grade to numerical score equivalence chart. Late assignments will be penalized 1/3 of a letter grade (e.g., from A to A-), per weekday except for medical reasons (see the "Student Declaration of Absence" note below).

Student Declaration of Absence:
Students may self-declare illnesses. Please review the university's policy (https://tinyurl.com/dal-sda-form).
Absences/extensions lasting more than 3 days require a doctor's note. A missed test without an SDA may not be permitted.

Co-Learning:
This course evaluates students individually, yet encourages group learning. For group projects, there will be both an individual mark and a group mark distributed. A small portion of the marks will reflect individual contributions to group work whereas individual works will reflect an individual's work exclusively. The instructors will base this mark on their own observations and advice from the teaching assistants.

Computers:
This course will require students to make use of, at a minimum, AutoCAD, and Sketchup. Rhino and Revit are optional. Students should have these program on their laptops for in-class work. Basic concepts and functions will be introduced gradually through the term by way of extracurricular workshops and general support provided by the Help Desk assistants. Student trial versions of the program are available online.

Learning Objectives:
Students accumulate a deeper knowledge of the fundamentals of building construction, building structure and envelope assemblies at the scale of single and multi-unit housing in this eastern Canadian climate. Students will develop a proficiency to design and integrate knowledge systematically in the context of B2 term design project as well as an ability to represent building information in a technical manner that reflects professional practice standards.

Additional Academic Support:
Software support for Brightspace and TEAMS is available through the Dalhousie ITS site https://www.dal.ca/dept/its/current.html as well as the School of Architecture's Computer Help Desk. The links to the library and copyright office are below.
- Dalhousie Libraries: http://libraries.dal.ca
- Copyright Office: https://libraries.dal.ca/services/copyright-office.htmlUniversity Policies and Resources:
This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate:
https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog
See the School's "Academic Regulations" page (tinyurl.com/dal-arch-regulations) for links to university policies and resources:

- Academic Integrity
- Accessibility
- Code of Student Conduct
- Diversity and Inclusion – Culture of Respect
- Student Declaration of Absence - go to https://tinyurl.com/dal-sda-form

- Territorial Acknowledgement: Dalhousie University is located in Mi'kma'ki, the ancestral and unceded
- territory of the Mi'kmaq. We are all Treaty people.1
- Work Safety
- Fair Dealing policy
- Important Dates in the Academic Year (including add/drop dates): http://www.dal.ca/academics/important_dates.html
- Dalhousie Grading Practices Policy: https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

CACB Student Performance Criteria
The BEDS/MArch program enables students to achieve the accreditation standards set by the Canadian Architectural Certification Board. They are described at https://tinyurl.com/cacb-spc-2017 (pages 14–17). This Dalhousie ARCH course addresses the CACB criteria and standards that are noted on the "Accreditation" page of the School of Architecture website: https://tinyurl.com/dal-arch-spc.

UNIVERSITY GRADE STANDARDS (UNDERGRADUATE)

Letter	Percent	Definition	Description
A+	90–100%	Excellent	Considerable evidence of original thinking; outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base.
A	85–89%		
A–	80–84%		
B+	77–79%	Good	Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.
B	73–76%		
B–	70–72%		
C+	65–69%	Satisfactory	Evidence of some understanding of the subject matter; ability to develop solutions to simple problems.
C	60–64%		
C–	55–59%		
D	50–54%	Marginal pass	Evidence of minimal familiarity with the subject matter; minimal analytical and critical skill.
F	0–49%	Inadequate	Insufficient evidence of understanding of the subject matter; weakness in analytical and critical skills; limited or irrelevant use of the literature.
INC		Incomplete	(counts as zero in GPA calculation)
W		Withdrew after deadline	(neutral in GPA calculation)
ILL		Compassionate reasons, illness	(neutral in GPA calculation)

Student Learning Experience Questionnaires (SLEQ) will be scheduled during class time in the last two weeks.

B2 TECH 2024 TERM SCHEDULE

	TUESDAYS 2:30-5:30 PM		FRIDAYS 2:30-4:00 PM	
WEEK 1	JANUARY 9, 2024	Introduction	JANUARY 12, 2024	Lecture - Intro to Architectural Drawing and Modeling
WEEK 2	JANUARY 15-19, 2024	PROFESSIONAL PRACTICE WEEK		
WEEK 3	JANUARY 23, 2024	Lecture: Wood Construction I Introduction of Assignment 1 - Language of Construction (L.O.C.)	JANUARY 26, 2024	Lecture: Wood Construction II
WEEK 4	JANUARY 30, 2024	Lecture: Structural Concepts I In-Class L.O.C. Workshop / Tutorials	FEBRUARY 2, 2024	Munro Day - No Class
WEEK 5	FEBRUARY 6, 2024	Lecture: Structural Concepts II In-Class L.O.C. Workshop / Tutorials	FEBRUARY 9, 2024	LANGUAGE OF CONSTRUCTION ASSIGNMENT DUE - ROUND ONE PRESENTATIONS
WEEK 6	FEBRUARY 13, 2024	LANGUAGE OF CONSTRUCTION - ROUND TWO PRESENTATIONS (IF NEEDED - TBD) Introduction of Assignment 2 - Aperture	FEBRUARY 16, 2024	QUIZ #1 - Wood Construction and Structural Concepts
WEEK 7	FEBRUARY 19-23, 2024	WINTER BREAK		
WEEK 8	FEBRUARY 27, 2024	Lecture: Building Envelope Basics I In-Class Aperture Workshop	MARCH 1, 2024	Lecture: Building Envelope Basics II
WEEK 9	MARCH 5, 2024	Lecture: Sustainability I - Operational Carbon In-Class Aperture Workshop	MARCH 8, 2024	Lecture: Sustainability II - Embodied Carbon
WEEK 10	MARCH 12, 2024	In-Class Aperture Workshop	MARCH 15, 2024	APERTURE ASSIGNMENT DUE - ROUND ONE PRESENTATIONS
WEEK 11	MARCH 19, 2024	APERTURE ASSIGNMENT - ROUND TWO PRESENTATIONS (IF NEEDED - TBD) Introduction of Assignment 3 - Expression of Construction (E.O.C.)	MARCH 22, 2024	QUIZ #2 - Building Enclosures and Sustainability
WEEK 12	MARCH 26, 2024	In-Class E.O.C. Workshop / Tutorials	MARCH 29, 2024	Good Friday - No Class
WEEK 13	APRIL 2, 2024	In-Class E.O.C. Workshop / Tutorials	APRIL 5, 2024	Last Day of Classes EXPRESSION OF CONSTRUCTION ASSIGNMENT DUE (WITH DESIGN)
WEEK 14	APRIL 8-12, 2024	BEDS DESIGN REVIEWS		

TEXTS AND REFERENCES:

Texts available via Novanet:

Allen, Edward and Joseph Iano. 2014. *Fundamentals of Building Construction, 6th ed.,* Hoboken: John Wiley & Sons.
https://login.ezproxy.library.dal.ca/login?qurl=https%3a%2f%2febookcentral.proquest.com%2flib%2fDAL%2fdetail.action%3fdocID%3d1411616

Canadian Home Builders' Association, *Builders' Manual. The definitive guide to building homes in Canada.*
https://dal.novanet.ca/permalink/01NOVA_DAL/1vjc6md/alma990053993590107190

Free PDF online:
Canada Mortgage and Housing Corp. 2013. *Canadian Wood Frame House Construction.* Canada: CMHC.
https://chbanl.ca/wp-content/uploads/CMHC-Canadian-Wood-Frame-House-Construction.pdf

Other references (not required):
Allen, Edward. 2005. *How Buildings Work, The Natural Order of Architecture.* New York: Oxford University Press.
Brock, Linda, 2005. *Designing the Exterior Wall: An Architectural Guide to the Vertical Envelope.* Hoboken: John Wiley and Sons.
Ching, Francis DK. 2014. *Building Construction Illustrated, Fifth Edition.* Hoboken: John Wiley and Sons.
Ching, Francis DK. 1996. *A Visual Dictionary of Architecture.* Hoboken: John Wiley and Sons.
Deplazes, Andrea. 2005. *Constructing Architecture, Materials, Processes, Structures, A Handbook.* Basel: Birkhauser.
Gordon, J. E. 2003. *Structures or Why Things Don't Fall Down.* Cambridge: De Capo Press.
King, Bruce. 2017. *The New Carbon Architecture: Building to Cool the Climate.* Gabriola: New Society Publishers.

Magwood, Chris. 2014. *Making Better Buildings: A Comparative Guide to Sustainable Construction for Homeowners and Contractors. Gabriola:* New Society Publishers.
Reid, Esmond. 1995. *Understanding Buildings, A Multidisciplinary Approach.* Boston: MIT Press.
Sandaker, Bjorn N. and Arne P. Eggen and Mark R. Cruvellier. 2019. *Structural Basis of Architecture.* New York: Routledge.
Srinivasan, Ravi and Kiel Moe. 2015. *The Hierarchy of Energy in Architecture: Emergy Analysis*. New York: Routledge.

Other Sources:
Students are encouraged to find other sources for construction details, in books or periodicals or online. It is important to discuss these sources with your tutors before applying them. All references must be cited by:

architect
building name
location (city, country)
year(s) of design/construction or completion
and the publication from which the image was reproduced (author, date, title, city, publisher)..