



Winter 2024

Course Number	ARCH 612	Classroom	CBDL Classroom C
Course Name	Building Science and Technologies II		
Pre/Co-Requisites	Arch 508: Building Science and Technologies I		
Instructor	David Leonard	Office Hours/Location	By appointment
	Email: david.leonard@ucalgary.ca		Phone: 403-700-0167
Class Dates	Mandatory all in-person: Mondays and Wednesdays, Mondays and Wednesdays, 11:00am to 12:30am		
Instructor Email Policy	Please note that all course communications must occur through @ucalgary email, and I will respond to emails sent via student's @ucalgary emails within 48 hours.		
Name and Email of Teaching Assistant(s)	Daniel Morley, Gaurav Goswami		

Course Description:

This course explores the application of building science theory to building enclosure, examination of building elements and the application of building components to specific problems in architecture. This course focuses on the application of building science principles to building structures and enclosures. It examines various types of building elements in manners appropriate to their intended functions and performances. The understanding of building enclosures requires a familiarity with individual components that make up the total structure. Each component interacts and interrelates with one another. This course examines the function and configuration of building components from footings to wall and roofing systems.

[University of Calgary : Architecture ARCH \(ucalgary.ca\)](https://www.ucalgary.ca/architecture)

Course Hours: 3 units; (3-0)

Online Delivery

This course will take place **online** via Desire2Learn (D2L). Students are required to participate in the asynchronous learning tasks using the D2L learning environment. If unable to participate due to unforeseen circumstances, inform the instructor in advance to work out an alternative participation activity.

Course Learning Outcomes:

Upon completion of this course, students will know and be able to:

1. To develop a sound understanding of building envelope components and their influence on building performance, design intent and sustainability. Including the primary building envelope barriers that contribute to building envelope performance.
2. To develop an understanding of the building process and constructability in building envelope design.
3. To become familiar with the requirements of the National and Alberta Building Code including the National Energy Code of Canada for Buildings that impact the building envelope.
4. To acquire the necessary skills to read, design and illustrate architectural details as an effective means of communication related to the building envelope.
5. To understand most of the building envelope systems available to design on a project, when they should be used and what limitations the systems and their components may have.

Learning Resources:

For this course, most required study material will be provided by the Instructor. It is suggested that students become familiar with the following:

Note: Be aware of where you are getting information and how it relates to application of that information. Many publications are produced outside of Alberta and Canada and may provide information relevant to building practices in the jurisdiction the information is being published that is not applicable or appropriate for the Canadian, Albertan or Calgary market context.

National Research Council

NRC Electronic National Construction Codes and Guides provides free download of 2019 National Building Code (Alberta Edition) – 2019 NBC (AE) and 2017 National Energy Code for Buildings (2017 NECB) @ www.nrc.canada.ca Canadian Building Digest, Institute for Research in Construction, National Research Council of Canada @ www.nrc.ca/irc/cbd

Associations

AAA Website, Continuing Education, CMHC & OAA Articles @ www.aaa.ab.ca

Alberta Building Envelope Council (ABEC) South, <https://abecsouth.org/resources>

Building Science Fight Club, [Building Science for Architects \(buildingsciencefightclub.com\)](http://Building Science for Architects (buildingsciencefightclub.com))

Alberta Roofing Contractors Association (ARCA), [ARCA \(arcaonline.ca\)](http://ARCA (arcaonline.ca))

Building Science Consultants

Building Science Corporation (Note USA principles primarily) @ www.buildingscience.com

RDH Building Science Inc. @ www.rdh.com

Morrison Hershfield, Insights, Building Envelope Thermal Bridging Guide @ www.morrisonhershfield.com

High Performance Enclosures, publication by John Straube Building Construction Illustrated, publication by Francis Cheng

Various Webinar presentations by John Straube & Joe Lstiburek

Building Envelope water/air/vapour membrane suppliers

Soprema Build Better Guide @ www.soprema.ca

Building Science Deconstructed, Beyond the Perfect Wall @ www.Dorken.com

Rockwool North America, Technical Resources @ [Fire and Soundproofing Insulation | ROCKWOOL](#)

Technology requirements (D2L etc.):

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- *A computer with a supported operating system, as well as the latest security, and malware updates;*
- *A current and updated web browser;*
- *Webcam (built-in or external);*
- *Microphone and speaker (built-in or external), or headset with microphone;*
- *Current antivirus and/or firewall software enabled;*
- *Broadband internet connection*

Most current laptops will have a built-in webcam, speaker and microphone

Workshop Safety Training Requirement

If a course requires the use of the SAPL workshop, students must complete all online University of Calgary safety courses, the online Trajectory safety training course, as well as in-person workshop training and a grade of pass on the final evaluation project, to be granted access to the SAPL workshop. This training is offered once a year, around the start of the Fall term and has a completion deadline.

Additional Classroom Conduct and Related Information

Guidelines for Zoom Sessions in Online Classes

Students are expected to participate actively in all Zoom sessions and to turn on their webcam. Please join our class in a quiet space that will allow you to be fully present and engaged in the Zoom sessions. Students must behave in a professional manner during the session. Students, employees, and academic staff are also expected to demonstrate behaviour in class that promotes and maintains a positive and productive learning environment

Assessment Components:

Assessment Method	Description	Weight	Aligned Course Learning Outcome
Assignment 1 (Individual Assignment)	Primary Building Envelope Barriers Denotation	10	1
Assignment 2 (Team Assignment)	Presentation	25	1, 2, 4 and 5
Assignment 3 (Team Assignment)	Roof/Wall/Window Assemblies	25	1 and 2
Assignment 4a (Team Assignment)	Roof/Wall/Window Sections and Studio Project Elevations / Plans	Not Graded	1, 2, 3, 4 and 5
Assignment 4b (Summative Team Assignment)	Studio Project Details with Elevations, Plans and Renderings	40	1, 2, 3, 4 and 5

Assessment and Evaluation Information

Attendance and Participation Expectations:

Attendance and Participation Expectations: Attendance is recommended for all lectures, slides will be available following each lecture, video/audio recording of the lectures will not be provided. Expectations for Writing (<https://www.ucalgary.ca/pubs/calendar/current/e-2.html>):

Guidelines for Submitting Assignments: Guidelines for Submitting Assignments: Submit via D2L, in PDF format with file name “*ASSIGNMENT #.STUDENT NAME(s).pdf*”

Final Examinations: Final Examinations: There will be no final exam, the final assignment is to be provided in conjunction with studio project.

Expectations for Writing (<https://www.ucalgary.ca/pubs/calendar/current/e-2.html>):

Late Assignments: Late Assignments: Late assignments will be docked 5% (one grade point).

Criteria that must be met to pass: Criteria that must be met to pass: A passing grade is required on all assignments in the course; if students miss a passing grade on any one assignment, a supplemental assignment will be required to ensure minimum passing grade for each assignment is achieved, a maximum of one supplemental assignment will be allowed for each student.

Grading Scale:

Grade	Grade Point Value	4-Point Range	Percent	Description
A+	4.00	4.00	95-100	Outstanding - evaluated by instructor
A	4.00	3.85-4.00	90-94.99	Excellent - superior performance showing comprehensive

				understanding of the subject matter
A-	3.70	3.50-3.84	85-89.99	Very good performance
B+	3.30	3.15-3.49	80-84.99	Good performance
B	3.00	2.85-3.14	75-79.99	Satisfactory performance
B-	2.70	2.50-2.84	70-74.99	Minimum pass for students in the Faculty of Graduate Studies
C+	2.30	2.15-2.49	65-69.99	All final grades below B- are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements.
C	2.00	1.85-2.14	60-64.99	
C-	1.70	1.50-1.84	55-59.99	
D+	1.30	1.15-1.49	50-54.99	
D	1.00	0.50-1.14	45-49.99	
F	0.00	0-0.49	0-44.99	

A student who receives a "C+" or lower in any one course will be required to withdraw regardless of their grade point average (GPA) unless the program recommends otherwise. If the program permits the student to retake a failed course, the second grade will replace the initial grade in the calculation of the GPA, and both grades will appear on the transcript

The School of Architecture, Planning and Landscape will not permit the Flexible Grade Option (CG Grade) for any course offered by the School.

<https://www.ucalgary.ca/pubs/calendar/current/f-1-3.html>

CACB Student Performance Criteria

The following CACB Student Performance Criteria will be covered in this course at a primary level (other criteria will be covered at a secondary level): A7: Detail Design; A8: Design Documentation; C1: Regulatory Systems; C2: Materials; C4: Envelope Systems; C5: Environmental Systems; D1: Comprehensive Design.

Topic Areas & Detailed Class Schedule

On the following page is an outline of the topics to be covered during each week of classes including assignments and their due dates. Group presentations (Assignment 2) will be completed at the start of each class starting Feb 5 following the presentation plan.

Course Schedule Date	Topic	Assignments/Due Dates
Jan 8 – 12	Introduction to Building Science and Technology II and Primary building envelope barriers	
Jan 15 – 19	Primary building envelope barriers	
Jan 22 – 26	Assignment 1 in Class and Cladding Systems Lecture	Assignment 1 – draw air / vapor / thermal / moisture barriers on 3 instructor provided details
Jan 29 – Feb 2	Façade Design	
Feb 5 – 9	Presentations	Assignment 2 Façade precedents presentations
Feb 12 – 16	Winter SAPL Block week	
Feb 19	Family Day Observed	
Feb 19 – 23	Winter Term Break	
Feb 26 – Mar 1	Fenestrations and Roofing	
Mar 4 – 8	Building Envelope Assemblies and Desk Crits	
Mar 11 – 15	Energy Codes and Desk Crits	Assignment 3 submit proposed roof, wall, and window assemblies page (shared deliverable with studio)
Mar 18 – 22	Building Envelope Constructability and Desk Crits	
Mar 25 – 28	Building Envelope Detailing and Detail Party	Assignment 4a submit revised assemblies and list of proposed details
Mar 29	Good Friday – University closed	
Apr 1	Easter Monday – University closed	
Apr 2 – 5	Desk Crits / Detail Party	
Apr 8 – 9	Desk Crits / Detail Party	Assignment 4b submit all drawings including drainage and details (shared deliverable with studio, but due on a different date)
Apr 15 – 19	Final Review week	
<ul style="list-style-type: none"> • Topics listed above indicate first (Monday class), and second (Wednesday class) topics to be lectured or desk crits/assignments to be scheduled. • Presentations, Desk crits and Detail Party will be set by instructor provided schedules. • Grey rows above indicate no class during that time period. 		

Special Budgetary Requirements

Special budgetary requirements are limited to the optional purchase of course readings and, in specific courses, mandatory supplementary fees to cover certain expenditures, such as field trips. Mandatory supplementary fees must be approved by the University prior to implementation. Instructors are required to list and describe approved optional and mandatory supplementary fees for courses. This can include possible costs incurred for special materials, equipment, services, or travel.

University of Calgary Policies and Supports

ACADEMIC ACCOMMODATION

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/university-policies-procedures/student-accommodation-policy>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>. Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to their instructor (contact information on first page above).

SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/.

ACADEMIC MISCONDUCT

Academic Misconduct refers to student behavior which compromises proper assessment of a student's academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

For information on the Student Academic Misconduct Policy and Procedure please visit: <https://www.ucalgary.ca/legal-services/university-policies-procedures/student-academic-misconduct-policy>

Additional information is available on the Academic Integrity Website at <https://ucalgary.ca/student-services/student-success/learning/academic-integrity>.

COPYRIGHT LEGISLATION:

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (<https://www.ucalgary.ca/legal-services/university-policies-procedures/acceptable-use-material-protected-copyright-policy>) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy (<https://www.ucalgary.ca/pubs/calendar/current/k.html>).

INSTRUCTOR INTELLECTUAL PROPERTY

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

Student information will be collected in accordance with typical (or usual) classroom practice. Students' assignments will be accessible only by the authorized course faculty. Private information related to the individual student is treated with the utmost regard by the faculty at the University of Calgary.

SEXUAL AND GENDER-BASED VIOLENCE POLICY

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. The University of Calgary's sexual violence policy guides us in how we respond to incidents of sexual violence, including supports available to those who have experienced or witnessed sexual violence, or those who are alleged to have committed sexual violence. It provides clear response procedures and timelines, defines complex concepts, and addresses incidents that occur off-campus in certain circumstances. Please see the policy available at <https://www.ucalgary.ca/legal-services/university-policies-procedures/sexual-and-gender-based-violence-policy> .

UNIVERSITY STUDENT APPEALS OFFICE

If a student has a concern about a grade that they have received, they should refer to Section I of the Undergraduate Calendar (<https://www.ucalgary.ca/pubs/calendar/current/i-3.html>) which describes how to have a grade reappraised. In addition, the student should refer to the SAPL's Procedure for reappraisal of grades

OTHER IMPORTANT INFORMATION

Please visit the Registrar's website at: <https://www.ucalgary.ca/registrar/registration/course-outlines> for additional important information on the following:

- Wellness and Mental Health Resources
- Student Success
- Student Ombuds Office
- Student Union (SU) Information
- Graduate Students' Association (GSA) Information
- Emergency Evacuation/Assembly Points
- Safewalk