



Winter 2024

Course Number	ARCH 614	Classroom	CBDL Classroom C
Course Name	Environmental Control Systems		
Pre/Co-Requisites			
Instructor	James Furlong	Office Hours/Location	By Appointment
	Email: jfurlong@mcw.com / james.furlong@Ucalgary.ca		Phone: 403.716.3841
Class Dates	Mandatory all in-person: Tuesday and Thursday, January 9 – April 19, 9:00am to 10:30am		
Instructor Email Policy	Please note that all course communications must occur through your @ucalgary email, and I will respond to emails sent via student's @ucalgary emails within 48 hours (of weekdays-not including weekends). Please have ARCH 614 in the subject line. My work email jfurlong@mcw.com is best for fast response. CC'@Ucalgary		
Name and Email of Teaching Assistant(s)	Twinkle Lakhani: twinkle.lakhani@ucalgary.ca Prerna Bhatia: prerna.bhatia@ucalgary.ca		

Course Description:

[ARCH 614 - Environmental Control Systems - Winter 2024 | University of Calgary Contacts \(ucalgary.ca\)](#)

A comfortable, healthy and productive indoor environment is a critical goal in the design of buildings. Achieving this may be challenging in a cold climate where several factors must be considered and balanced simultaneously. The ultimate goal of the course is to bridge the gap between architecture and mechanical engineering, seeking to achieve a sustainable built environment. The course explores the design of building mechanical systems for cold climates, outlining key aspects that architects should be aware of while reducing the negative environmental effects of constructing and operating active building systems.

Course Hours: 3 units

Course Learning Outcomes:

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

1. Apply basic passive design strategies for building systems to reduce operation energy requirements while maintaining comfort.
2. Understand the basic factors that contribute to human comfort.
3. Demonstrate an awareness of issues related to the energy efficiency and renewable energy for buildings in cold climates.
4. Apply the basic first principles of thermal transfer through the building envelope (walls, roof, exposed/buried floors, and glazing) in order to perform simple heat loss/gain calculations.
5. Evaluate design decisions on heat loss/gain through the building envelope.
6. Understand various mechanical system options available to common building typologies.
7. Understand mechanical control systems. Understand approximate sizing methods for ductwork and other components.
8. Organize major mechanical system components in relation to other building systems, include the envelope, structure, lighting and fire/life safety.
9. Apply the principles of ventilating buildings in cold climates (including natural ventilation, ventilation heat recovery, passive cooling, etc.)
10. Develop architectural design that integrate mechanical systems together with other building systems. The placement of mechanical rooms and shafts, etc.

Learning Resources:

Required textbooks and learning materials:

- The Architects Studio Companion: Rules of Thumb for Preliminary Design

Suggested (optional) textbooks and learning materials:

- W.T. Grondzik, A.G. Kwok, B.Stein, J.S. Reynolds, Electrical and Mechanical Equipment for Buildings

In addition, list of readings related to selected topics will be posted periodically on D2L

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

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
Project Presentation (Group)	<i>Passive design strategies included in concept design</i>	10%	1-3
Mid Term Exam	<i>Based on materials covered in weeks 1-4</i>	15%	1-4
Final Exam	<i>Final Exam Based on Total Course Content</i>	15%	1-10
Design Project (Group)	<i>Aligned with Studio</i>	50%	1-10
Participation	<i>Active Participation Participation in this class, including attendance and participating actively in class discussions, will form 10% of the total student grade. Please have the courage to ask questions in front of your peers!</i>	10%	

Assessment and Evaluation Information

Attendance and Participation Expectations:

- The passive design presentation will focus on the passive design strategies employed for your comprehensive studio design, focused on efforts to reduce heating and cooling loads. Aspects such as shape and orientation, quantity and placement of glazing, materials selection, passive features such as operable windows, clerestories, etc.

(Outcomes 1, 2 & 3). 3% of the 10% grade depends on evaluating other student submissions and on their evaluation of your presentation.

- The mid term exam will be based on materials covered in weeks 1-5 (Outcomes 1, 2, 3, 4).
- The final exam will cover all course materials (Outcomes 1-10).
- Design Project: (Outcomes 1-10).

Guidelines for Submitting Assignments:

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

Note: for group projects, please upload one (1) submission per team.

See topic areas and detailed class schedule.

Final Examinations: There is a final in class examination (1.5 hours)

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

Late Assignments:

- Loss of One (1) Grade Level for every 24 hours of delay

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 (for Architecture courses only)

The following CACB Student Performance Criteria will be covered in this course at a primary level: B8 Environmental Systems; C2 Building Systems Integration; B10 Building Service Systems. The following Performance Criteria will be covered at a secondary level: B4. Sustainable Design; C1 Detailed Design Development; C4 Comprehensive Design. (see CACB SPC matrix for further details)

Topic Areas & Detailed Class Schedule

Below is an outline of the topics to be covered during each week of classes including assignments and their due dates. Group presentations will be completed and submitted to D2L at the start of each class following the presentation plan.

Course Schedule Date	Topic	Assignments/Due Dates
Jan 8 – 12	<p>Introduction to Building Mechanical Systems and History of Building Systems in North America.</p> <p>Introduction/Review of Passive and Climate Responsive Design (passive heating, cooling, ventilation, daylighting) orientation, thermal massing. etc.</p> <p>Introducing Passive Design Assignment 1.</p>	

Jan 15 – 19	<p>Passive Design Continued.</p> <p>Thermal comfort & Environmental Quality.</p> <p>Introduction to heat Transfer. Introduction to heating and cooling loads.</p> <p>Rules of Thumb – sizing AHUs and ducts.</p> <p>January 19: Introducing Term Project</p>	
Jan 22 – 26	<p>Simple Calculations Methods for Heating and Cooling Loads – Continued.</p> <p>Desk Critiques of initial passive concepts.</p>	
Jan 29 – Feb 2	Presentations	Passive Design Presentations *due January 30 before class
Feb 5 – 9	Intro to active systems: Heating ventilation and Air Conditioning (HVAC)	
Feb 12 – 16	Winter SAPL Block week	No Classes
Feb 19	Family Day Observed	
Feb 19 – 23	Winter Term Break	
Feb 26 – Mar 1	HVAC Continued. Typical Systems for Small Buildings (residential, commercial)	February 29 Mid. Term Exam
Mar 4 – 8	HVAC Continued. HVAC for Large Buildings. Primary/Central Plant Equipment and Mech Room Considerations (venting, louvers, size and placement, Water meter rooms etc).	
Mar 11 – 15	HVAC Continued. Air/Water Distribution. Project Tutorial.	

Mar 18 – 22	Final Exam	March 21 Final Exam
Mar 25 – 28	Engineering and Architectural Collaboration & Desk Crits.	
Mar 29	Good Friday – University closed	No Classes
Apr 1	Easter Monday – University closed	
Apr 2 – 5	Engineering and Architectural Collaboration & Desk Crits.	
Apr 8 – 9	Engineering and Architectural Collaboration & Desk Crits.	Final Project Submission *due April 9
Apr 15 – 19	Final Review week	No 614 Class

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