



Course Number	ARCH 614	Classroom	Tuesday/Thursday Room PF 3160
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: e.g. Tuesdays and Thursdays, 9 am – 10:30 am		
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 faster response.		
Name and Email of Teaching Assistant(s)	Jo-Lynn Yen jolynn.yen@ucalgary.ca Sonia Kamal sonia.kamal@ucalgary.ca		

Course Description

[ARCH 614 - Environmental Control Systems - Winter 2022 | EVDS \(ucalgary.ca\)](#)

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 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

Online Delivery

This course will take place live in classroom. If it transitions **online** via Desire2Learn (D2L), lectures may be scheduled virtually at the instructors direction with 7 days notice on Zoom. Students are

required to participate in the asynchronous learning tasks using the D2L learning environment and synchronous Zoom sessions, when utilized. If unable to participate live due to unforeseen circumstances, inform the instructor in advance to work out an alternative participation activity (e.g., watch the recordings, submit a brief reflection, and actively contribute to the follow-up online discussion).

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 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 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
- [Student IT Resources](#)

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>	25%	1-10
Design Project (Group)	Aligned with Studio 616 and 612	50%	1-10

Assessment and Evaluation Information

Attendance is recommended for all lectures, slides will be available following each lecture, video/audio recording of the lectures will not be provided.

- The passive design presentation will focus on the passive design strategies employed for your comprehensive studio 616 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 1-4 (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"

Guidelines for Submitting Assignments:

- See topic areas and detailed class schedule.

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

Late Assignments:

- 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.

CACB Student Performance Criteria

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
January 10 & 12	<p>Introduction to Building Mechanical Systems and History of Building Systems in North America.</p> <p>Introduction to Passive and Climate Responsive Design (passive heating, cooling, ventilation, daylighting) orientation, thermal massing. etc.</p>	
January 17 & 19	<p>Passive Design Continued.</p> <p>Thermal comfort & Environmental Quality.</p> <p>Introduction to heat Transfer. Introduction to heating and cooling loads. Rules of Thumb.</p> <p>January 19: Introducing Term Project</p>	
January 24 & 26	<p>Simple Calculations Methods for Heating and Cooling Loads – Continued.</p> <p>Desk Critiques of initial</p>	

	passive concepts.	
January 31 February & 2	Desk Crits of Passive Presentations Intro to active systems: Heating ventilation and Air Conditioning (HVAC)	
February 7 & 9	Presentations Heating ventilation and Air Conditioning (HVAC)	Passive Design Presentations *due Feb 7 before class
February 14 & 16	HVAC Continued. Typical Systems for Small Buildings (residential, commercial)	February 16 Mid. Term Exam
February 19-25	No Classes (UofC Reading Break)	
February 28 & March 2	HVAC Continued. HVAC for Large Buildings. Primary/Central Plant Equipment and Mech Room Considerations (venting, louvers, size and placement, Water meter rooms etc).	
March 7 & 9	HVAC Continued. Air/Water Distribution. Project Tutorial. March 10 Guest Speaker - Ben Ellah, Stantec Consulting Recreation Centres: Environmental Control Design	
March 13-17	No Classes (Block Week)	
March 21 & 23	Distribution Systems. Air, Water, etc.	
March 28 & 30	Final Exam Critiques of Projects	March 30 Final Exam
April 4 & 6	Engineering and Architectural Collaboration & Desk Crits	
April 11 & 13	Engineering and Architectural Collaboration & Desk Crits	
April 18 & 20	Engineering and Architectural Collaboration & Desk Crits	Final Project Submission *due April 18 before class

April 25 & 27	Engineering and Architectural Collaboration & Desk Crits	
<p>Indicate the following dates:</p> <ul style="list-style-type: none"> • If applicable, dates, times and locations of all approved class activities scheduled outside of regular course hours <ul style="list-style-type: none"> ○ N/A 		

Guidelines for Zoom Sessions

Zoom is a video conferencing program that will allow us to meet at specific times for a “live” video conference, so that we can have the opportunity to meet each other virtually and discuss relevant course topics as a learning community.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor’s permission.

The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as per the [Code of Conduct](#)). When entering Zoom or other video conferencing sessions (such as MS Teams), you play a role in helping create an effective, safe and respectful learning environment. Please be mindful of how your behaviour in these sessions may affect others. Participants are required to use names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities.

Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under relevant University of Calgary conduct policies (e.g. [Student Non-Academic Misconduct Policy](#)). If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception, and on what terms. For more information on how to get the most out of your zoom sessions visit:

<https://elearn.ucalgary.ca/guidelines-for-zoom/>

If you are unable to attend a Zoom session, please contact your instructor in advance to arrange an alternative activity for the missed session (e.g., to review the recorded session). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in Zoom sessions. Students will be advised by their instructor when they are expected to turn on their webcam (for group work, presentations, etc.).

The instructor may record online Zoom class sessions for the purposes of supporting student learning in this class – such as making the recording available for review of the session or for students who miss a session. Students will be advised before the instructor initiates a recording of a Zoom session. These recordings will be used to support student learning only and will not be shared or used for any other purpose.

University of Calgary Policies and Supports

COVID-19 PROCEDURE FOR SICK STUDENTS: <https://ucalgary.ca/risk/sites/default/files/Covid-19%20Folder/COVID-19-Procedure-for-Sick-Students.pdf>

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/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

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: 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://ucalgary.ca/policies/files/policies/student-academic-misconduct-policy.pdf>

<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-procedure.pdf>

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 (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) 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 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/policies/files/policies/sexual-violence-policy.pdf>

UNIVERSITY STUDENT APPEALS OFFICE: If a student has a concern about the course, academic matter, or a grade that they have been assigned, they must first communicate this concern with the instructor. If the concern cannot be resolved with the instructor, the student can proceed with an academic appeal, which normally begins with the Faculty. <https://www.ucalgary.ca/secretariat/student-appeals>

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