

Environmental Control Systems
Prof. Jim Love
e: love@ucalgary.ca
office: PFB 3181

EVDA 615 Q(1.5-0)
Winter 2012
p: 403-220-7428
office hours: MW 1400-1500

Introduction

A major function of buildings in the very cold Prairie climate is the provision of thermal comfort and ventilation. Building systems should minimize adverse environmental effects at the global level (e.g., by reducing demands for fossil fuels) while meeting these requirements. The technologies used to serve these ends are examined in this course, including their role in the composition of buildings. Other systems including active fire protection and mechanical movement are also examined

Objectives

1. Ability to integrate major mechanical systems such as air distribution into an architectural design, including approximate sizing of ducts and other mechanical system components.
2. Awareness of basic heat transfer and ventilation processes,
3. Understanding of organization of major mechanical system components in relation to overall design concept, including structure, enclosure, indoor climate control, lighting, movement, plumbing and fire safety.
4. Awareness of comfort, climate, precedents, and environmental concerns as influencers of system design.
5. Awareness of issues related to energy efficiency and renewable energy.

Teaching Approach

The course will be presented primarily in lecture and workshop mode, with substantial reliance on student review of readings. Typical approaches to systems design will be reviewed in terms of air-handling process and spatial organization. A site visit to a local building will provide an opportunity to view approaches to systems design firsthand. The assignment is conceptual design of a ventilation system for the studio project, using rules of thumb for sizing.

Content: Topic Areas

1. The functions and characteristics of environmental control systems will be reviewed, as well as their place in the development of design concepts. Components and terminology will be discussed, as well as elementary sizing procedures. Factors in systems design will be examined, including:
2. Requirement for environmental control systems: thermal comfort, air quality.
3. Types of ventilation and thermal control systems.
4. Performance criteria for the evaluation of systems, (e.g., human comfort, air quality, system capabilities, cost, energy efficiency, codes).
5. Spatial requirements.
6. Visual treatment of systems.
7. Interrelationship of systems (e.g., envelope and mechanical system requirements).
8. Heat transfer processes.
9. Other issues: water and waste systems, active fire and smoke control, wind effects, mechanical movement systems, costs for environmental control systems.

Means of Evaluation

Evaluation will be based on:

Project	75%
Test	25%
Total	100%

The final test will be an open book examination.

Grading

Grading will be based on the following scale:

Letter Grade	4-Point Range	Description
A+	4.00	Outstanding - evaluated by instructor
A	3.85-4.00	Excellent - superior performance showing comprehensive understanding of the subject matter
A-	3.50-3.84	Very good performance
B+	3.15-3.49	Good performance
B	2.85-3.14	Satisfactory performance
B-	2.50-2.84	Minimum pass for students in the Faculty of Graduate Studies
C+	2.15-2.49	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	1.85-2.14	
C-	1.50-1.84	
D+	1.15-1.49	
D	0.50-1.14	
F	0-0.49	

Readings

The course text is

Stein, B., J. S. Reynolds, W.T. Grondzik, and A. Kwok
Electrical and Mechanical Equipment for Buildings (11th Edition), 2010
Wiley, ISBN 978-0-470-19565-9

Notes

1. Written work, term assignments and other course-related work must be submitted by the course Blackboard system.
2. Classes will normally be held Tuesdays but may be held Tuesdays and/or Thursdays for purposes of coordination with ENME 583.
3. It is the student's responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the start of this course.
4. Plagiarism - Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Most

Commonly plagiarism exists when:(a) the work submitted or presented was done, in whole or in part, by an individual other than the one submitting or presenting the work (this includes having another impersonate the student or otherwise substituting the work of another for one's own in an examination or test),(b) parts of the work are taken from another source without reference to the original author,(c) the whole work (e.g., an essay) is copied from another source, and/or,(d) a student submits or presents work in one course which has also been submitted in another course(although it may be completely original with that student) without the knowledge of or prior agreement of the instructor involved. While it is recognized that scholarly work often involves reference to the ideas, data and conclusions of other scholars, intellectual honesty requires that such references be explicitly and clearly noted. Plagiarism is an extremely serious academic offence. It is recognized that clause (d) does not prevent a graduate student incorporating work previously done by him or her in a thesis. Any suspicion of plagiarism will be reported to the Dean, and dealt with as per the regulations in the University of Calgary Graduate Calendar.

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5. Information regarding the Freedom of Information and Protection of Privacy Act (<http://www.ucalgary.ca/secretariat/privacy>) and how this impacts the receipt and delivery of course material.
6. Emergency Evacuation/Assembly Points (<http://www.ucalgary.ca/emergencyplan/assemblypoints>).
7. Safewalk information (<http://www.ucalgary.ca/security/safewalk>).
8. Contact Info for: Student Union (<http://www.su.ucalgary.ca/page/affordability-accessibility/su-structure/contact-info>); Graduate Student representative(<http://www.ucalgary.ca/gsa/>) and Student Ombudsman's Office (<http://www.su.ucalgary.ca/page/quality-education/academic-services/student-rights>).

Canadian Architectural Certification Board - Performance Criteria Met by Course

The following CACB Student Performance Criteria will be covered in this course at a primary level: B6 Life Safety Systems (active systems), B8 Environmental Systems, B10 Building Service Systems, C2 Building Systems Integration.

The following CACB Student Performance Criteria will be covered in this course at a secondary level: B4 Sustainable Design, B11 Building Economics (elemental cost of HVAC systems), C1 Detailed Design Development.

Detailed Schedule

- Th., Jan. 12 (1) Overview: Thermal and Air Quality Control in Architecture
- Th., Jan. 19 (2) Site Visit - ICT and TFDL Buildings
- Th., Jan. 26 (3) Air Distribution System Types
- Th., Feb. 2 (4) Site Visit - EEEL Building
- Th., Feb. 9 (5) Approximate System Sizing and HVAC Plant Components
- Th., Feb. 16 block week
- Th., Feb. 23 (6) block
- Th., Mar. 1 (7) Thermal Comfort and Air Quality
- Th., Mar. 8 (8) Energy Standards and Environmental Rating Systems
- Th., Mar. 15 (9) Energy Performance and Envelope Components
- Th., Mar. 22 (10) Systems for Housing and Small Buildings
- Th., Mar. 29 (11) Active Systems for Fire and Smoke Control
- Th., Apr. 5 (12) Water and Waste Systems; Wind and Noise Considerations
- Th., Apr. 12 (13) Review