

## ***Health in the Built Environment***

***EVDS 621 H(3-0)***

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PFA-3194, hours by appointment

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### **Introduction**

This course will raise the student's awareness of indoor environmental conditions that affect occupant health and well being. Indoor environments include acoustics, lighting, indoor air quality, radio-frequencies, etc. They will learn how building related problems can be mitigated. Various strategies for achieving indoor environmental quality in buildings throughout the building process from selecting a site and building design to constructing and maintaining the building is discussed.

We spend approximately 90% of our time in an indoor environment. Autonomic reactions to contaminants such as particulates, VOC's and moulds entering the body can result in fatigue, dizziness, headaches, and the inability to concentrate which, in turn, decreases a person's alertness and efficiency. Other conditions in the indoor environment can also affect the health and well-being of occupants including electromagnetic radiation, noise and light pollution, and radioactive gases. A healthy indoor environment must therefore minimize those conditions that greatly affect the occupant's health and well-being.

The course examines concepts of human health in an environmental context; historic approaches to health, well-being will include case studies in indoor environmental quality and other conditions affecting occupant health; and strategies for the design and maintenance of healthy buildings.

Students will conduct an indoor environmental investigation to assess the conditions that may or may not affect occupant health and well-being. Any potential problems identified must be assessed and locate its probable sources. They must also develop realistic strategies to mitigate the problem in the building.

The course is useful for students in many disciplines, particularly those in Environmental Design, Medicine, Social Work, Engineering, and Law, etc. This course is also useful for practitioners and anyone who wishes to understand more about their own environment, either at school, in the workplace or at home.

### **Objectives of the Course**

1. To introduce the student to the problems associated with building related illness caused by improper planning, building design, construction and maintenance.
2. To understand the types of indoor environmental conditions such as sound, light, air contaminants and wireless communication radiations that can affect occupant health.
3. To acquire a general understanding of public health issues, and related regulations and standards.
4. To develop skills in examining indoor environmental quality problems in buildings through the use of proper sampling protocols and instruments.
5. To develop skills at identifying sources of air contaminants, its origin, and develop practical mitigating measures.

## **Teaching Approach**

The purpose of this class is to introduce the students to how the design of the indoor environment affects occupant health. There will be stimulating discussions and presentations of case studies will illustrate the consequence of not understand how building materials, mechanical systems, and building envelopes can affect occupants.

This is a lecture course with class discussions and videos. Assignments will demonstrate the student's understanding of building systems and its impact on occupant health and well-being. Class presentations will be evaluated on knowledge of indoor contaminants, rigour of indoor environmental quality investigations and developing solutions to address problems identified.

This course is scheduled for Monday and Wednesdays 12:30-13:50, Room PF 2165.

## **Content: Topic Areas & Detailed Class Schedule**

### **Schedule of Lectures and Readings**

#### **Jan. 9 Introduction to health in the built environment.**

Course outline, human comfort and environmental factors.

*Assignment #1: Report on an indoor contaminant.*

#### **Jan. 14 Indoor Environments affecting occupant health**

Determinants of health and wellness.

Vital signs readings: Indoor air quality and buildings. P. 2-3

#### **Jan. 16 Air quality and air contaminants**

Sources, generation, characteristics, location and occupancies.

Video: Sick Building Syndrome –Suzuki.

Sears readings: p.33-36

#### **Jan. 21 Acoustics, lighting, seasonal affective disorder, etc.**

Video: Public Exposure: DNA, Democracy, and the Wireless Revolution.

Sears readings: p.39-42

#### **Jan. 23 Indoor Environments affecting occupant health:**

Radio frequencies, EMF, cell phones, WiFi, satellite radio, wireless internet, non-ionizing radiation etc.

Video: Electromagnetic Radiation: A Scientific Overview

#### **Jan. 28 Indoor air contaminants:**

Airborne particles, target and acceptable concentration levels.

Video: NOVA Can Buildings Make You Sick?

Vital signs readings: Environmental contaminants. P. 9

#### **Jan. 30 Indoor air contaminants:**

Chemical, micro-organisms, target and acceptable concentration levels.

Vital signs readings: Table of contaminants. P. 49-54

#### **Feb. 04 Sources of air contaminants**

Sources, generation, characteristics, location and occupancies.  
Video: Environmentally Sick Schools.  
Vital signs readings: Sources of air contaminants. P. 10-14

**Feb. 06 Ventilation, airflow**

Exhaust, supply air, re-circulation, ASHRAE guideline, building codes.  
Video: Taking Action & Ventilation Basics  
Sears readings: p.37-38

**Feb. 11 Class presentations**

**Feb. 13 Class presentations**

***Due: Report #1 @ midnight.***

**Feb. 18 Family Day (Class Cancelled)**

**Feb. 20 Block week (Class Cancelled)**

**Feb. 25 Air cleaning devices**

Types of air cleaners, portables, limitations, standards.  
Video: IAQ for Schools, Ventilation

**Feb. 27 IAQ investigation.**

Standards, tools and limitations  
Vital signs readings: Field protocols. P. 20-42  
***Assignment #2: IEQ Investigation.***

**Mar. 04 Sampling protocols and equipment.**

adsorption tubes, sampling bags, GC/MS, airborne particle counter, meters, calibrations, Gauss meter, airflow, temperature, humidity, bioassay. Case studies.  
Vital signs readings: Equipment description. P. 56-58

**Mar. 06 Occupant health and the indoor environments.**

Interaction with the physical environment, diet, air, sunlight, water, etc., chemical and allergies, epidemiology, MCS.  
Vital signs readings: Human comfort. P. 4-8  
Sears readings: p. 2-28

**Mar. 11 Occupant health and the indoor environments.**

Personal exposure and health risk to indoor air contaminants, medical intervention, environmental medicine and respiratory illness.  
Video: Up Close and Personal, The Nature of Things, David Suzuki.

**Mar. 13 Moulds in native housing.**

Types of moulds, standards and guidelines.  
Design, construction and maintenance and mould propagation.  
Video: 5th estate, Camp Hill Hospital.  
Sears readings: p.36-37

**Mar. 18 Moulds in courthouse and hospitals.**

Video: Moulds in a Courthouse.  
Vital signs readings: Mitigation strategies. P. 15-19

**Mar. 20 Moulds in schools.**

Video: W5 Moulds in portable classrooms.

**Mar. 25 Class presentations**

**Mar. 27 Class presentations**

**Apr. 01 Moulds and its mitigation.**

Vital signs readings: Mitigation strategies. P. 15-19

***Due midnight: Assignment #2.***

**Apr. 03 Designing Healthy buildings**

Video: This clean house.

**Apr. 08 Designing and maintaining for occupant health**

Video: IAQ tools for schools.

**Apr. 10 Housing for the environmentally sensitive.**

Accommodation for those with environmental sensitivities.

Video: 7 Unit apartments – Ottawa.

Sears readings: p. 43-47

**Apr. 15 Classes cancelled** (Bldg. code meeting, Ottawa)

**Means of Evaluation**

The two reports must be properly researched, analysed and written with proper grammar, spelling and reference format. Class presentations are an integral part of acquiring and demonstrating knowledge and skills in this subject. The final grade is based on the following:

<b>Assignment #1: Report on an indoor contaminant.</b>	30%
An individual research paper with a 10-minute class presentation	10%
<b>Major team project: IEQ investigation (team).</b>	40%
<i>A team investigation of a building to determine it's environmental problems and develop potential remedies and design guideline.</i>	
<i>There is a 15 minute class presentations.</i>	<u>20%</u>
	<b>Total 100%</b>

*Note: A passing grade in all assignments and exam is required in order to pass the course as a whole.*

*Final grades will be reported as letter grades, with the final grade calculated according to the 4-point range.*

*All assignments will be evaluated by their letter grade equivalents as shown.*

**Registrar-scheduled Final Examination:** No

### Policy for Late Assignments

Assignments submitted after the deadline will be penalized with the loss of a grade (e.g.: A- to B+). For late submission after one week but not more than 2 weeks late, the loss will be two grades, e.g.: A- to B. Assignments will not be accepted after 3 weeks.

### Grading Scale

Faculty shall use the following methods for reporting grades and for determining final grades. Final grades shall be reported as letter grades, with the grade point value as per column 2. Final grades shall be calculated according to the 4-point range in column 3. Should faculty members evaluate any individual exams or assignments by percentage grades, the equivalents shown in column 4 shall be used.

Grade	Grade Point Value	4-Point Range	Percent	Description
A+	4.00	4.00	92.5-100	Outstanding - evaluated by instructor
A	4.00	3.85-4.00	85-92.49	Excellent - superior performance showing comprehensive understanding of the subject matter
A-	3.70	3.50-3.84	80-84.99	Very good performance
B+	3.30	3.15-3.49	76-79.99	Good performance
B	3.00	2.85-3.14	73-75.99	Satisfactory performance
B-	2.70	2.50-2.84	70-72.99	Minimum pass for students in the Faculty of Graduate Studies
C+	2.30	2.15-2.49	66-69.99	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	63-65.99	
C-	1.70	1.50-1.84	60-62.99	
D+	1.30	1.15-1.49	56-59.99	
D	1.00	0.50-1.14	50-55.99	
F	0.00	0-0.49	0-49.99	

Notes:

- 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.

### Readings

Lee, T.G., *Vital Signs* curriculum package and other handouts. Download from <http://arch.ced.berkeley.edu/vitalsigns/res/downloads/rp/iaq/iaq.pdf>

Readings: Vital Signs, p. \_.

Sears, M.E. (Ed.) **The Medical Perspective on Environmental Sensitivities.**  
Canadian Human Rights Commission, Government of Canada, Ottawa, April 2007.  
[http://www.chrc-ccdp.ca/pdf/envsensitivity\\_en.pdf](http://www.chrc-ccdp.ca/pdf/envsensitivity_en.pdf)  
Readings: Sears, p. \_.

## **Special Budgetary Requirements – Nil.**

### **Notes:**

1. Written work, term assignments and other course related work may only be submitted by e-mail if prior permission to do so has been obtained from the course instructor. Submissions must come from an official University of Calgary (ucalgary) email account.
2. 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. (<http://www.ucalgary.ca/drc/node/46>) 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.
3. 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.
4. 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
5. Emergency Evacuation/Assembly Points (<http://www.ucalgary.ca/emergencyplan/assemblypoints>)
6. Safewalk information (<http://www.ucalgary.ca/security/safewalk>)
7. Contact Info for: Student Union (<http://www.su.ucalgary.ca/page/affordability-accessibility/contact>); 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>).