

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

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

***Tang G. Lee***

***Winter 2016***

*lee@ucalgary.ca* 403-220-6608  
PFA-3194, hours by appointment

Classroom PF-2140, every Tuesdays 18:00-20:50

### **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 minimise 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**

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.

## Content: Topic Areas & Class Schedule

### Jan. 13 Introduction to health in the built environment.

Course outline, human comfort and environmental factors.

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

#### Indoor Environments affecting occupant health

Determinants of health and wellness.

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



### Jan. 20 Air quality and air contaminants

Sources, generation, characteristics, location and occupancies.

Video: Sick Building Syndrome –Suzuki.

Sears readings: p.33-36

#### Acoustics, lighting, seasonal affective disorder, etc.

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

Sears readings: p.39-42



### Jan. 27 Indoor Environments affecting occupant health:

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

Video: Electromagnetic Radiation: A Scientific Overview



### Feb. 03 Indoor air contaminants:

Airborne particles, target and acceptable concentration levels.

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

Video: NOVA Can Buildings Make You Sick?

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

Vital signs readings: Environmental contaminants. P. 9

#### 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. 10 Ventilation and airflow

Exhaust, supply air, re-circulation, ASHRAE guideline, building codes.

Video: Taking Action & Ventilation Basics

Sears readings: p.37-38

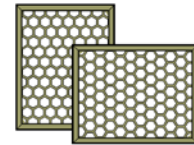


## Feb. 14-21 Reading Week - Classes cancelled

**Feb. 24 Class presentations - Assignment #1: Report on an indoor contaminant.**  
**Mar. 2 Due Report #1 @ midnight.**

### Mar. 2 Air cleaning devices

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



### Mar. 9 IAQ investigation, sampling protocols and equipment.

Standards, tools and limitations  
adsorption tubes, sampling bags, GC/MS, airborne particle counter, meters, calibrations, Gauss meter, airflow, temperature, humidity, bioassay. Case studies.  
Vital signs readings: Field protocols. P. 20-42  
Vital signs readings: Equipment description. P. 56-58  
**Assignment #2: IEQ Investigation.**



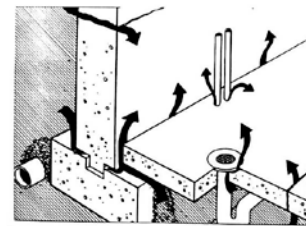
### Mar. 16 Occupant health and the indoor environments.

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



### Mar. 23 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



### Moulds in schools, courthouses and hospitals.

Video: W5 Moulds in portable classrooms.  
Video: Moulds in a Courthouse.  
Vital signs readings: Mitigation strategies. P. 15-19

### Moulds and its mitigation.

### Mar. 30 Flood mitigation and Radon

### Apr. 6 Designing and maintaining for occupant health Designing Healthy buildings

Video: IAQ tools for schools.  
Video: This clean house.

### Housing for the environmentally sensitive.

Accommodation for those with environmental sensitivities.  
Video: 7 Unit apartments – Ottawa.  
Sears readings: p. 43-47



### Apr. 13 Class presentations



**Due Apr 17: Report #2 @ midnight.**

**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%
Individual research paper + 10-min. class presentation	10%
<b>Major team project: IEQ investigation (team).</b>	40%
<i>A team investigation of a building to determine its environmental problems and develop potential remedies and design guideline.</i>	
<i>There is a 15-20 (depends on class size) 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	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	

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>

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/eng/content/medical-perspective-environmental-sensitivities>

### 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. Academic Accommodations. Students who require 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 or the designated contact person in EVDS, Jennifer Taillefer (jtaillef@ucalgary.ca). Students who require an accommodation unrelated to their coursework or the requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Vice-Provost (Student Experience). For additional information on support services and accommodations for students with disabilities, visit [www.ucalgary.ca/access/](http://www.ucalgary.ca/access/)

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>).