Indoor Environmental Quality (IEQ) – ENVE 4106 / 5104
Fall 2014, Lectures: Tuesdays, 8:35-11:35, UC378
Tutorials and Labs: Mondays (even weeks), Sect. 2: 11:35-14:35, Sect. 1: 14:35-17:25, CB5301
Instructor: Prof. William (Liam) O’Brien, PhD, Liam.O’Brien@carleton.ca, CB 5208
Office hours: TBD

Course description
This course examines a wide variety of factors affecting the indoor environmental quality (IEQ), how to measure it, how to analyze it, and how to improve it. IEQ is comprised of indoor air quality (IAQ), thermal comfort (TC), visual comfort (VC), and acoustic comfort (AC). Each of these four major elements of IEQ is comprised of three major lessons: 1) concepts, 2) measuring and modelling, and 3) design. By the end of the course, students should have good knowledge of IEQ issues, metrics, measurement techniques, modelling, solutions, and approaches to design. Several guest lectures and technical tours may be used to supplement the regular lectures. These will be announced at least one week in advance.

Learning objectives
After taking the course, students should be able to:
- Identify major sources of indoor air pollution, know their causes, and suggest methods for mitigation
- Perform psychrometric calculations and read/use a psychrometric chart
- Describe the major functions of HVAC equipment and systems and perform basic related calculations
- Create and apply an IEQ testing plan
- Understand IEQ modeling methodologies
- Model IEQ under steady-state and dynamic conditions using custom models
- Model IEQ in simple buildings using several different software packages
- Understand basic IEQ (thermal, visual, acoustic) criteria and models and be able to perform basic related calculations
- Be familiar with the high-level societal implications of IEQ and state-of-the-art IEQ-related technologies and controls

Evaluation
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<th>Assignments (4 total, spaced at about 3-week intervals)</th>
<th>50% (12.5% each)</th>
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<td>Final Exam - Covers entire term; during exam period</td>
<td>50%</td>
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All evaluation (assignments, exams) will be in SI units. However, it would be beneficial for students to be comfortable with basic conversions to IP units (e.g., CFM).

Course Materials
Course/exam material consists of: freely available textbook chapters, blackboard notes, PowerPoint presentations, conference and journal papers, government reports, and building standards. The concepts discussed by the guest lecturers are also testable on final exam. Hand-written notes will not be made available.

Assignments
Four assignments will be given throughout the term. They will be due either one or two weeks after they are assigned. They are due at the beginning of the lecture. Assignments are to be completed individually; evidence of direct copying will be treated as cheating and will be handled accordingly (i.e., reported to the Dean’s office). Late assignments and other reports will be accepted but with a 20% per weekday mark reduction. Assignments may not be emailed; hard copies only. Late assignments may be slid under Prof. O’Brien’s office door.

Participation
A significant portion of lectures will be devoted to discussing contemporary IEQ issues and academic publications. Therefore, students are expected to read assigned readings before class so they can participate in these discussions throughout the entire term.

Exam
The final exam is during the designated exam period and will cover all material taught during the course. It will be multiple choice and concept- and calculation-based. A 1-page (8.5" by 11", single-sided) formula sheet is allowed, but the exams are otherwise closed book. Notes, diagrams, and other conceptual materials are not permitted on the formula sheet.

IEQ Modelling Software (freely available for download on Windows-based PCs and installed on lab computers for tutorials)
1. IA-QUEST
2. CONTAM
3. ASHRAE Thermal Comfort Tool
4. LBNL COMFEN
5. DAYSIM