

Course “Indoor Air Quality and Ventilation”

Spring 2019

Monday, 16h15 – 19h00; Room: GC B3 30

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Office and hours: Mondays 14h45 to 16h00, office [GC A1 344](#) (by appointment only)

Date	Topics covered	Material for reading	Tasks due
18 Feb 2019	Introduction to topic/field: <ul style="list-style-type: none">- Course introduction- Indoor and outdoor air quality- Overview of indoor aerosols & gases- Why do we care about IAQ?		
25 Feb 2019	Material-balance models for buildings <ul style="list-style-type: none">- Steady state and dynamic Air exchange rate in buildings		
04 Mar 2019	Gaseous pollutants: <ul style="list-style-type: none">- Properties of gases- Sources and emission models- Adsorption/desorption- Reactive surface deposition- Homogeneous chemistry- Reaction byproduct formation Measuring organic gases Course project overview*		
11 Mar 2019	Indoor aerosols: <ul style="list-style-type: none">- Indoor particle sources- Particle size distribution- Particle dynamics- Deposition and resuspension- Penetration/infiltration Aerosol measurement techniques		
18 Mar 2019	Special topics in IAQ: <ul style="list-style-type: none">- Indoor microbiology- Airborne infectious disease transmission- IAQ in developing countries		
25 Mar 2019	Guest lecture – Dr. Jovan Pantelic, UC Berkeley IAQ assessment methods: <ul style="list-style-type: none">- Review of the scales with respect to IAQ- Review of available tools- Design stage tools- Tools for post occupancy evaluation- Methods for advanced building operation		
01 Apr 2019	Written mid-term exam based on theory 1		

08 Apr 2019	Exposure: <ul style="list-style-type: none"> - Human exposure patterns - Exposure definitions and role of IAQ in exposure assessment - Direct and indirect assessment of IAQ and exposure - Integral mass balance for exposure, intake fraction & lung deposition models Project discussion		
15 Apr 2019	IAQ control: <ul style="list-style-type: none"> - Overview of control strategies - Perceived air quality - Ventilation requirements 		Blog post**
22 Apr 2019	No courses (Happy Easter holidays!)		
29 Apr 2019	Ventilation: <ul style="list-style-type: none"> - History of ventilation - Ventilation basics - Air exchange rates and room air distribution - Ventilation strategies 	Spengler Ch. 2	
06 May 2019	Filtration & air cleaning: <ul style="list-style-type: none"> - Air filtration – Particles - Removal of gases and vapors - Disinfecting air Project discussion		
13 May 2019	IAQ and ventilation standards and green building guidelines <ul style="list-style-type: none"> - SIA - EN - ISO - ASHRAE - LEED - WELL 		
20 May 2019	Written mid-term exam based on theory 2		
27 May 2019	Course project presentations in class		Final report*

*Course Project

You will work in teams to perform field investigation of indoor air quality at the GC building at EPFL campus. The aim of this project is to introduce you to the IAQ topic and writings of leading experts in the field, to learn how to perform IAQ assessment through handling instrumentation and conducting measurements, to conduct data analysis and calculations related collected data, and to give you practice of writing, presenting and discussing the results with the peers.

The class will be divided into 3 or 6 groups (depending of the number of students that sign up for the course). Each student will have his/her own individual set of responsibilities within the group project based on which grading will be done. The project will include several deliverables, including conducting a comprehensive review of existing literature on the topic of IAQ in buildings (exact type of building/space will be assigned/agreed in the class); utilizing state-of-the-art scientific instruments

to measure particle and gas-phase air pollutants in buildings (instructions will be given during the class); collect, extract, analyze and interpret data; prepare a final written report of the findings (something like a conference paper or journal article), and give an oral presentation to your classmates during the last week of the semester. For the purpose of oral presentation, each member of your team should present part of the work done using computer slides. You may use the blackboard to illustrate key points. You are expected to integrate course material to complete the course project and to demonstrate a firm understanding of project materials as reflected in the final written report and oral presentation.

The project report must be submitted in printed version on the date that it is due (refer to the course schedule for due dates). In addition, students must submit the report in the form of an electronic PDF (filename: Project Report_2019_GroupNickName.pdf).

The length of the report should be up to 10'000 words including tables and figures, but excluding the list of references. The structure of the report should be the same or similar to a journal publication style, including the following subsections: Abstract; Introduction; Methodology; Results; Discussion; Conclusions; References. For the purpose of data analysis, you will be encouraged to use Microsoft Excel, MATLAB or other software for data processing and plotting. The course project will be worth 45 points, with 30 points of your grade coming from the written project report and the other 15 points coming from the oral presentation. Both report and presentation will be graded based on the quality, completeness, accuracy, writing and presentation style.

****Blog Post**

Each student will be required to write one blog post throughout the duration of the course on topics related to indoor air quality (IAQ), indoor exposures, indoor environmental health, building ventilation and any other topics closely related to the course. The aim of this assignment is to deepen your familiarity on contemporary IAQ issues, as well as to encourage you to think about IAQ issues in a broader scientific and societal context, introduce you to the writings of leading experts in the field, and give you practice of concise writing of short and interesting columns.

You will be provided with a username for the course blog, which is available at the following URL: <http://XXX.wordpress.com> (will be announced in class). You will be expected to login and publish your post on the date that it is due (refer to the course schedule for due dates). You will be able to choose from the following list of topics:

- Air Humidity and Indoor Air Quality
- Biomass Cookstoves: Indoor Air Quality in a Global Context
- Microbiology of the Built Environment
- Impact of Indoor Air Quality on Human Productivity
- Environmental Tobacco Smoke
- Flame retardants: Good or Bad Guys?
- Phthalates: Good or Bad Guys?
- Airborne Infectious Disease Transmission in Hospitals
- Indoor Nanoparticles: Sources & Exposure
- Humans as Sources of Indoor Particles and Gases
- Novel Ventilation Strategies for Commercial Buildings
- Emerging HVAC Filtration and Air Cleaning Technologies
- IoT Sensing of Indoor Air Quality

Alternatively, you may propose your own topic (with permission from the lecturer). Examples of other possible blog posts include highlights of IAQ topics in the popular media, reviews of recently published peer-reviewed research articles, overviews of new or old IAQ standards, and many others.

The length of the blog post should be around 1'000 words (excluding the references, tables and figures) in order to fully explain your ideas on a subject, typically with one or two helpful figures and/or tables. The blog post will be worth 15 points, with 50% of your grade coming from completeness and accuracy of your post and the other 50% coming from your writing technique and grammar.

You must submit your own writing for this blog post. You are encouraged to discuss and even work with other students on blog post (unless explicitly told otherwise), but material that is submitted must be your own work.