Course “Fundamentals of Indoor Climate” (Fall 2024)

Thursday, 17h15 – 19h00; Room: INJ 218

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Office hours: Thursday 16h00 to 17h00, office GC A1 354 or online (by appointment only)

Week	Date	Topics covered	Notes
1	12/09	Introduction to topic/field: • Course introduction • Why do we care about indoor climate?	
2	19/09	Brush up lecture: • Heat transfer in buildings • Psychometrics: Definitions and charts **Course assignment overview***	
3	26/09	Human thermal comfort: • Thermal comfort fundamentals • Human body heat balance • Factors affecting thermal comfort • Local thermal discomfort • Quiz time	
4	03/10	Human thermal comfort assessment: • Actual thermal comfort • Models (PMV + Adaptive) • Standards requirements • Exercise • Quiz time	Course assignment topic selection due
5	10/10	Introduction to HVAC & psychrometric processes • Psychrometric processes in HVAC systems • Examples and exercises Project work and consultations (optional, 10 min)	
6	17/10	Written mid-term exam based on theory (Material from the weeks 1-5)	Venue: PO 01
7	24/10	Fall break (no course)	

8	31/10	Review of the mid-term exam (10 min)
		Indoor air quality
		• Fundamental principles
		• Sources of indoor air pollution
		  • Gaseous pollutants
		  • Particulate matter
		Quiz time	

9	07/11	Indoor air quality • Air quality assessment in buildings • Quiz time Project work and consultations	

10	14/10	Introduction to Ventilation: • IAQ control overview and definitions • Driving forces of ventilation • Air exchange rates • Ventilation requirements • Prescriptive method Analytical method	

11	21/11	IAQ controls:
		• Room air distribution
		• Ventilation strategies
		  • Mechanical ventilation
		  • Natural ventilation
		• Filtration & air cleaning
		Remaining schedule overview and course summary	

12	28/11	**Project work and consultations**	
13	05/12	Written exam based on theory (Material from the weeks 8-11 only)	Venue: PO 01
14	12/12	Course project presentations in class	Final presentations
15	19/12	Course project presentations in class	Final presentations
	20/12	Course project final submission of presentations	by 23:59h

*** Course assignment**

You will work in a group of ~4 students to prepare one topic related to the course content. The topic will be presented in with oral presentation through PPT slides that will be accompanied by feedback session by peers and the teacher, where the students will discuss the topics and lessons learnt. The aim of the course assignment is to deepen your familiarity on contemporary indoor climate issues and trends, as well as to encourage you to think about this topic in a broader scientific and societal context, introduce you to the writings of leading experts in the field, and give you practice of oral presentation and creating of interesting and visually stimulating PPT slides.

For the course project presentation, you are expected to address at least the following key points:

- Title and authors/presenters
- Motivation and process - Why did you select this topic and how did you find the relevant literature
- Introduction - Facts about the topic selected (e.g., specific air pollutant)
- Technical challenges including the effect on humans and influencing factors in buildings
- Remedial actions - What can we do to improve the situation?
- Conclusions
- References

General requirements:

- All images, text and graphics must be clear and legible (no blurry images).
- All images, graphics, data, quotes, etc. that you did not create yourself must be properly cited at each slide.

- Your group's presentation has a 12-minute time limit. You will not be able to thoroughly cover each topic you have studied, so be selective about what you would most like to share Be respectful to your classmates and rehearse your presentation ahead of time or risk being cut off by your teacher.

You will be able to choose from the following list of topics:

- Importance of Building Massing and Orientation for Indoor Climate
- Thermal Resistance of Building Façade and Indoor Climate
- How Has the Invention of Air-Conditioning Changed Architecture and Indoor Climate?
- Passive versus Active: What Matters More for Securing Good Indoor Climate?
- Air Humidity and Indoor Air Quality
- Impact of Indoor Air Quality on Human Productivity
- Thermal Comfort and Human Productivity
- Impact of Indoor Climate on Human Health
- Influence of Indoor Environment on Sleep Quality
- Human Productivity and Energy Use – Are These in Conflict?
- How will Climate Change Impact Indoor Climate?
- Role of Occupant Behavior on Indoor Climate Control
- Indoor Particles: Sources & Exposure
- Why does Mold Grow and How to Remediate it?
- How to Prevent Condensation in Buildings?
- Overheating of Buildings: Why we Should Tackle Overheating Early in the Design Process?
- Cooling of Buildings Without Air-Conditioning: Feasible or Not?
- Review of Post Occupancy Evaluation (POE) Tools
- Methods to Assess Indoor Climate: Pros and Cons
- IoT and Low-Cost Air Quality Sensors - Is this the future?
- Do Green Buildings Have Better Indoor Climate?
- Mechanical or Natural Ventilation?
- Air Infiltration in Buildings: A Friend or a Foe?
- Novel Ventilation Strategies for Commercial Buildings
- Emerging HVAC Filtration and Air Cleaning Technologies
- Role of Indoor Climate in Combating the Spread of Airborne Virus
- Personalized Ventilation – Is This a Future?
- Strategies to Achieve Thermal Comfort for All – How Well Can We Engineer It?

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

For the purpose of oral presentation, each member of your team should try to present part of the work done using computer slides. The length of the presentation should be around 10-15 slides and the duration of the presentation should not exceed 12 minutes. You are expected to demonstrate a firm understanding of project materials. The course assignment will be worth 40 points. The course project will be graded based on the quality, completeness, accuracy and presentation style.

Each project group must submit their own slides (in PDF format) via email on time for full credit. The file should be named according to the following convention: Group*X_Title of the presentation*. You are encouraged to discuss and even work with the students from other groups on this project (unless explicitly told otherwise), but material that is submitted must be your own work.