



COURSE: Indoor environment technology (5 ECTS)

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Basic information

Course name: Indoor Environment Technology

Teaching period: Second autumn, period I

Responsible teacher: Prof. Heidi Salonen

Previous knowledge:

- ❖ Indoor Air Quality (CIV-E3030) or
- ❖ Comfortable and Healthy Indoor Environments (EEN-E4001) or
- ❖ Principles and fundamentals of lighting (parallel attendance accepted) (ELEC-E8700)

The course indoor environment technology covers different indoor environment quality (IEQ) factors such as indoor air quality (IAQ), lighting, ventilation, and acoustic as well as the technology within these factors.

The course emphasizes the importance of multidisciplinary cooperation in achieving good IEQ and exposes students to state-of-the-art technologies, as well as strategies for creating, controlling and estimating different IEQ factors as well as considering the end-user comfort in non-industrial buildings.

Within the course, participants are required to

- ❖ write a group work report (5 Parts: 4 indoor environmental parts + group evaluation)
- ❖ present the group work
- ❖ complete 4 homework assignments (assignments 2 and 4 are mandatory)
- ❖ write a learning diary about each teaching event (6.9.2023; 13.9.2023; 20.9.2023; 25.9.2023; **2.10.2022 (excursio) MANDATORY EVENT**; 4.10.2023; 9.10.2023 (**MANDATORY EVENT**)); 11.10.2023 (**MANDATORY EVENT**))

The course includes a company seminar (and a company visit (excursion to Halton). **MANDATORY EVENTS!**

Summary of the teaching timetable

Wednesday 6th September at 9:15-12:00, R2

Wednesday 13th September at 9:15-12:00, R2

Wednesday 20th September at 9:15-12:00, R2

Monday 25th September at 9:15-12:00, R2

Monday 2nd October at 9-17 EXCURSION (HALTON, KAUSALA) **MANDATORY EVENT!!**

Wednesday 4th October at 9:15-12:00, R2

Monday 9th October at 9:15-12:15 (company seminar), R2 **MANDATORY EVENT!!**

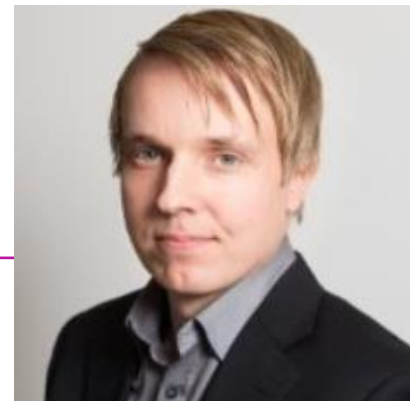
Wednesday 11th October at 9:15-12:00 (group work presentations), R2 **MANDATORY EVENT!!**

NOTE: The 11.10.2023 event is mandatory to pass the course. Absences from the events on 2.10.2023 and 9.10.2023 lower the grade by 0.5 credit points/event.

Responsible teacher: Heidi Salonen

Other teachers: Risto Kosonen, Jaakko Ketomäki, Heikki Ihasalo, Matias Remes + several visiting lecturers and company visitors

Assistant: Camilla Vornanen-Winqvist



Learning outcomes

- ❖ Recognize and communicate the entity of IEQ
- ❖ Describe the importance of multidisciplinary cooperation in achieving good IEQ
- ❖ Identify the challenges that different building segments (e.g., residential and public buildings) have in creating an optimal level of IEQ
- ❖ Describe the state-of-the-art technical solutions (ventilation, acoustic, lighting) for creating an optimal level of IEQ
- ❖ Identify and assess the different technical solutions for heating, cooling and ventilation
- ❖ Critically reflect and report on his or her own learning and the teaching methods used during the course
- ❖ Group working and presentation skills

Content

The course includes:

- Lectures
- Home assignments
- Company visit (excursion to Halton)
- Company seminar
- Group work (including 5 parts: 4 indoor environmental parts + group-/self-evaluation)
- Learning diary



Grading/Evaluation



1–5 based on group work (average grade of 5 different parts including 4 different group work topics and group evaluation*) (50%) and the learning diary (50%).

*each member of the group evaluates other group members as well as gives self-evaluation

Note: Group work presentation event on 11th October 2023 at 9:15-12:00 is compulsory.

In addition to the group work and learning diary, the homework assignments 2 and 4 are mandatory and must pass as an “accepted” grade. Homework assignments 1 and 3 will help you when working with the lecture task and writing your learning diary.

In the case in which the average of the marks (i.e. average of the group work parts 1-5 and learning diary) is not a full number, the grade of the learning diary determines if the final grade is rounded upwards or downwards.

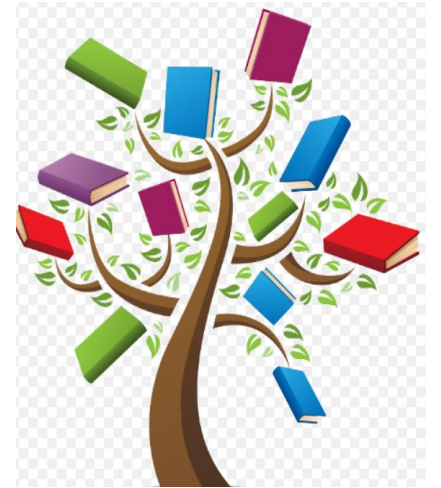


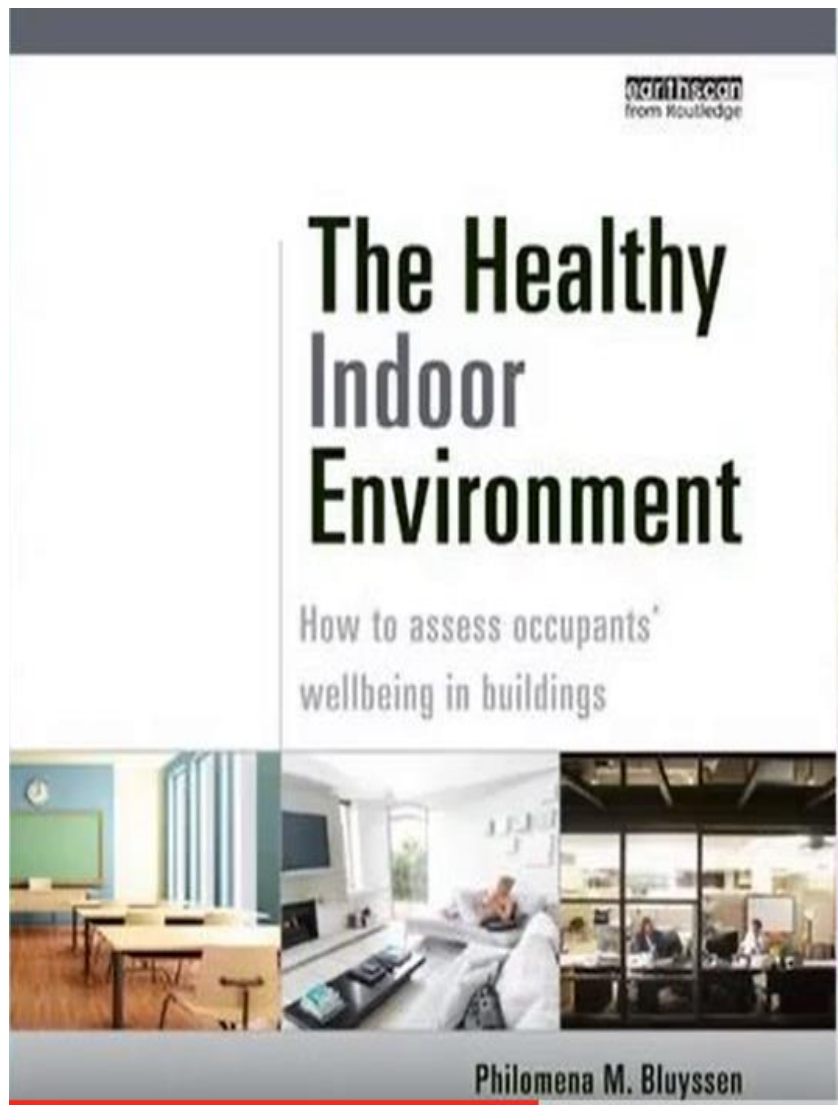
Study materials used during the course

- Lecture materials
- Group work materials
- Seminar materials
- Book (selected chapters and pages):

Bluyssen, P.M. The Indoor Environment Handbook. How to Make Buildings Healthy and Comfortable. 2009. Available online at: <http://file.zums.ac.ir/ebook/461->

[The%20Indoor%20Environment%20Handbook%20-%20How%20to%20Make%20Buildings%20Healthy%20and%20Comfortable-Philomena%20Blu.pdf](http://file.zums.ac.ir/ebook/461-The%20Indoor%20Environment%20Handbook%20-%20How%20to%20Make%20Buildings%20Healthy%20and%20Comfortable-Philomena%20Blu.pdf)





Published 31.12.2016

Despite policy directives, standards and guidelines, indoor environmental quality is still poor in many cases. **The Healthy Indoor Environment, winner of the 2016 Idec Book Award, aims to help architects, building engineers and anyone concerned with the wellbeing of building occupants to better understand the effects of spending time in buildings on health and comfort.** In three clear parts dedicated to mechanisms, assessment and analysis, the book looks at different indoor stressors and their effects on wellbeing in a variety of scenarios with a range of tools and methods. The book supports a more holistic way of evaluating indoor environments and argues that a clear understanding of how the human body and mind receive, perceive and respond to indoor conditions is needed. At the national, European and worldwide level, it is acknowledged that a healthy and comfortable indoor environment is important both for the quality of life, now and in the future, and for the creation of truly sustainable buildings. Moreover, current methods of risk assessment are no longer adequate: a different view on indoor environment is required. Highly illustrated and full of practical examples, the book makes recommendations for future procedures for investigating indoor environmental quality based on an interdisciplinary understanding of the mechanisms of responses to stressors. It forms the basis for the development of an integrated approach towards assessment of indoor environmental quality.

The book is useful (but not mandatory) for the course!

Link:

[The Healthy Indoor Environment: How to assess occupants' wellbeing in buildings - Philomena M. Bluysen - Google Books](#)

Homework 1 (individual homework assignment 1 before the lecture 1 (Wednesday 6th September 2023 lecture room R2))

1) READ THE BOOK CHAPTER:

Introductory chapter: Indoor Environmental Quality by Mujeebu M.A. 2019.

Chapter is available online at:

<https://www.intechopen.com/books/indoor-environmental-quality/introductory-chapter-indoor-environmental-quality>

2) READ THE JOURNAL PUBLICATION (Brink et al. 2021. Classrooms' indoor environmental conditions affecting the academic achievement of students and teachers in higher education: A systematic literature review) AND LIST THE MAIN FINDINGS/MOST INTERESTING FINDINGS FROM THE CHAPTERS 4.2 (The influence of the IEQ on the quality of learning) AND 4.3 (The influence of the IEQ on student's academic achievement).

Article is available online at:

<https://onlinelibrary.wiley.com/doi/full/10.1111/ina.12745>

Classrooms' indoor environmental conditions affecting the academic achievement of students and teachers in higher education: A systematic literature review (wiley.com)

Wed 6th September 2023 at: 9:15-12:00, lecture room R2

9:15–9:30 General features of the course, learning outcomes

9:30–10:00 The entity of indoor environment quality (IEQ)

10:00-10:15 Break

10:15-11:00 User centered and Inclusive Design, Ira Verma

11:00-11:45 “Salutogenic approach for workplace design”/”Workplace dimensions for promoting human well-being”, Virpi Ruohomäki

11:45-12:00 Discussion and feedback

Introduction to the “Big” course group work (including **Indoor air quality (part 1)**; **HVAC-technologies (Part 2)**; **Lighting and “smart” building technologies (Part 3)**; **Acoustic design (Part 4)** in an office building; and **Group evaluation (Part 5)**)

Homework 2 (individual/pair homework assignment 2) “Indoor environment aspects” **MANDATORY**

You can do the work alone or with a pair.

Select one office space (you can select a single office room or open-plan office. The office can be located in Otaniemi or it can be located anywhere).

Consider about

- Implemented beneficial indoor environment aspects in that space
- Indoor environment aspects which could be implemented in that space
- Detrimental indoor environment aspects which should be removed/fixed in that space

Check the following aspects of the indoor environment (focus on the aspects with underline):

Acoustic Quality; Air Quality; Lighting; Office Layout; Office Furnishings; Cleanliness and Maintenance; Thermal Comfort

Prepare a power point presentation about your findings (5 min presentation, about 5-8 slides). You can include photos/figures/tables to your presentation.

Power point presentation (everyone should upload the presentation even if they do it together with a pair) should be uploaded to the course page by 12th September 2023 at 23:59.

Homework 3 (individual home assignment 3):
Read the following publication:
Ensuring-Good-IAQ-in-Buildings-Trust-
report_compressed-2.pdf (bregroup.com) **OPTIONAL**
(Note! Lecture task will be based on the report)



Wed 13th September 2023 at 9:15-12:00, lecture room R2

9:15-9:45 Homework 2 “Indoor environment aspects” (5 presentations)

9:45-11:45 Indoor air quality (IAQ)

Introduction lecture + lecture task
(including 15 min break)

11:45-12:00 Introduction to the course group work part 1 (Indoor air quality), discussion and feedback, Heidi Salonen

Group work (part 1) should be uploaded to the course page by 19th September 2023 at 23:59.

Wed 20th September 2023 at 9:15-12:00, lecture room R2

9:15–11:45 Overview of HVAC-technologies for creating optimal IEQ in different building segments (heating, cooling, and ventilation), Risto Kosonen, Sami Lestinen

11:45-12:00 Introduction to the course group work part 2 (HVAC-technologies), discussion and feedback, Risto Kosonen, Sami Lestinen

Group work (part 2) should be uploaded to the course page by 26th September 2023 at 23:59.

Mon 25th September 2023 at 9:15-12:00 lecture room R2

9:15–10:00 Lighting, Jaakko Ketomäki

10:00–10:45 Human centric lighting/lighting & productivity/basics of lighting control, Henri Juslén (Helvar Oy Ab)

10:45-11:00 Break

11:00-11:45 Smart buildings (Automation and its appropriate use and control; security, surveillance, and various ICT systems), Heikki Ihasalo

11:45–12:00 Introduction to group work part 3 (Lighting and “smart” building technologies), Jaakko Ketomäki

Group work (part 3) should be uploaded to the course page by 3rd October 2023 at 23:59.

Individual homework assignment 4: Each student must read and comment (prepare a feedback report) on someone else’s learning diary (pairs will be named beforehand) by 10th October 2023. **MANDATORY!**

Mon 2nd October 2023 at 9:00-16:00 Excursion

MANDATORY EVENT!!!

Halton

Visit to Halton. Kausala

(Detailed program for the excursion will be published later)

You must register to the excursion via MyCourses by 18th September 2023 at 23:59! When registering, please also indicate any food restrictions (Halton offers lunch).

Note: A report about the visit is part of the learning diary.



Wed 4th October 2023 at 9:15-12:00, lecture room R2

9:15–11:30 Acoustical design of buildings and indoor environment – objectives, regulations, basic theoretical concepts; Basics of sound insulation, room acoustics and HVAC noise control, Matias Remes

11:30–11:45 Introduction to the group work part 4 (Acoustic design), Matias Remes

11:45-12:00 Discussion and feedback, Matias Remes

Group work (part 4) should be uploaded to the course page by 10th October 2023 at 23:59.

Mon 9th October 2023 at 9:15-12:15 Company seminar, lecture room R2, **MANDATORY EVENT!!**

9:15-9:45 New technology for design and maintain good IEQ, Tuomas Laine, Granlund

9:45-10:15 Sensation of Warmth - Physiologic Back-ground, Mikko Iivonen, Purmogroup

10:15–10:45 AI – brains of the building, Henri Juslén, Helvar Oy Ab

10:45-11:00 Break

11:00-11:30 Wellness and healthy indoor air through expertise and data management, Leif Virtanen, Ramboll Finland Oy

11:30-12:00 HVAC as a means of controlling indoor climate, Jesse Paakkari, Rejlers Rakentaminen Oy.

12:00-12:15 Discussion, feedback

Wed 11th October 2023 at 9:15-12:00

MANDATORY EVENT!!

- Course group work presentations (including 15 min break) + discussion
- Presemo- task (group work) about the learning diaries
- Discussion about the learning diaries and the whole course

Individual learning diary should be uploaded to the course page by 23rd October 2023 at 23:59.

Group evaluation (group work, part 5) should be uploaded to the course page by 17th October 2023 at 23:59.

Guidelines for learning diaries in the Indoor Environment Technology course



What is a learning diary and how is it written?

- A learning diary is a tool for reflection. It is a reflective writing assignment that is written as a follow-up of a course activity. It helps you to assess what you have learned on a course.
 - The aim of a learning diary is to summarise, analyse and comment on a course, lectures, individual work / group work, company/industry visits and seminar days.
 - A learning diary draws on the course lectures, seminar days and company/industry visits, but instead of just repeating what the lecturer or company visitors or representatives have said, you should reflect upon what you have heard and learnt (a diary is a subjective view). It is your own analysis and insights about what you have heard and learnt.
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- Reflect on the contents of the lecture both during and after class in relation to your own views of the issues at hand. Consider, too, how the lecturer/company visitor got his/her message across.
- The following questions may help you write your learning diary:

1) What did I learn? What kind of teaching method(s) used supported my learning? What was new to me? Was there something that changed my views and why? Focus on and analyse the themes important to you.

2) What did I not understand and why? What went against my own ideas? Why? What was less comprehensible? Why? Did I disagree with something that the lecturer said? Focus on and analyse the questions that left you puzzled.

3) What the course taught is likely to have some relevance for you and your studies. Can you identify what this relevance was? How are you able to apply the relevant knowledge to your studies? How does it support your development as a student? Do you have career plans where you may put the knowledge acquired in the course to use? Make note of and reflect on thoughts that you have that seem especially important.

- You should write your learning diary over a period of time. Writing is a process or a repeated activity that consist of several entries made at different times. It is usually necessary to have a strict routine for filling in a diary in order to keep up regular entries, as many details and recollections fade within the first 24 hours.
 - The sensible thing to do is write a brief summary of the thoughts raised by the lecture soon after the class. It may prove hard to go back to the lecture notes months after the lecture.
 - You do not necessarily have to use supplementary literature to write a learning diary, but you may wish to make use of both prior learning and the relevant literature to enhance your work. Take note of the literature recommended by the teacher.
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- **You should write 1-2 pages about each teaching event (6.9.2023; 13.9.2023; 20.9.2023; 25.9.2023; 2.10.2022 (excursio); 4.10.2023; 9.10.2023; 11.10.2023)**
 - **Total minimum length for your learning diary is 8 pages, maximum length 16 pages including figures/tables). Use font size 12, line spacing 1.5, normal margins 1 inch (= 2.54 cm) to 1.25 inches (= 3.17 cm)).**
 - You may write a chronological diary, but an essay form is also possible. An essay will also demonstrate your ability to organise and analyse knowledge. While writing a diary in essay form, do not forget that the learning diary should be based on the lecture notes and it should contain the lecture's key contents.
 - **To conclude the diary, you should write a 1/2-page summary on what the course taught and meant for you.** This is also an excellent opportunity to give feedback about the course as a whole.
 - Finally, make an effort to write lucidly. Work on the language!
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“Midterm” learning diary, deadline 6th October 2023

Final learning diary, deadline 23rd October 2023

- A reflective summary of the learning during the course, including reflection about all lectures (+ assignments), company/industry visits and seminar days.
 - It is written by making regular entries.
 - The length of the final learning diary is approx. 10–12 pages.
 - Name the diary-documents as follows: First name_Last name_Midterm_learning diary _2023; First name_Last name_Final_learning diary_2023
 - Submit the “midterm” learning diary by 6th October 2023 and the final learning diary by 23rd October 2023.
 - You must have your learning diary up-to-date and with you on 11th October 2023. There will be group work based on the individual learning diaries.
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Assessment and grading:

Below are *very general guidelines* to give some idea what is required for each grade

Points	The learning diary shows..
4-5	deep learning on the topics and the “big” picture; personal touch and applications, various perspectives.
3-4	wider learning and reflection; relations between topics, and personal context, applications.
2-3	some learning of the topics; personal perspective and reflection.
1-2	little or no reflection; descriptive “report”; misunderstood central concepts.
0	grave misunderstanding of the whole topic; no effort put in the work.

Group work

Group work includes 5 different parts: 4 indoor environmental parts + group evaluation

- ❖ Indoor air quality (IAQ) (part 1)
- ❖ HVAC (Heating, ventilation, and air conditioning) -technologies (part 2)
- ❖ Lighting and “smart” building technologies (part 3)
- ❖ Acoustic design (part 4)

in an office building

+ Group evaluation (part 5)

Group work (part 1) should be uploaded to the course page by 19th September 2023 at 23:59.

Group work (part 2) should be uploaded to the course page by 26th September 2023 at 23:59.

Group work (part 3) should be uploaded to the course page by 3rd October 2023 at 23:59.

Group work (part 4) should be uploaded to the course page by 10th October 2023 at 23:59.

Group evaluation (part 5) should be uploaded to the course page by 17th October 2023 at 23:59.

Grading/Evaluation

50% of the course grade is based on the group work (average grade of 5 different parts including 4 different group work topics (indoor environmental parts) and group evaluation*)

*each member of the group evaluates other group members as well as gives self-evaluation. The grade from part 5 is the average grade of your self-evaluation and grades that your group members gave you in their evaluations.

NOTE: The 11.10.2023 event (group work presentations) is mandatory to pass the course. Absences from the events on 2.10.2023 (excursion) and 9.10.2023 (company seminar) lower the grade by 0.5 credit points/event.

Choosing a group for the group work

- Go to MyCourses -> Assignments -> Group choice for group work
- Enroll in one group
- Max. 4 students can enroll in one group
 - If there will be many groups with less than 4 persons, the groups will be combined by the teachers
- CHOOSE YOUR GROUP BY **12th SEPTEMBER 2023 (at 23:59)**
- After you have enrolled in a group, contact your group members to begin the work together

General instructions and estimated workload for the group work

Instruction for group work parts 1-4 (indoor environmental parts):

Write 3-4 pages (font size 11)/each part (may include 1-3 figures/tables/pictures)

Prepare 4 separate files and name the files as follows: Group work_Part 1_Group number XX; Group work_Part 2_Group number XX; Group work_Part 3_Group number XX; Group work_Part 4_Group number XX)

Prepare a seven-minute power point presentation about the given part of your group work (the part/each group will be listed in MyCourses later)

Estimated workload 12.5 hours/student/each part

Instruction for group work part 5 (group work evaluation):

Fill in the “Group work evaluation” questionnaire in MyCourses.

Before the group work, please read the following article:

The logo for The Journal of Effective Teaching, featuring the letters 'JET' in a stylized, cursive font.

The Journal of Effective Teaching
an online journal devoted to teaching excellence

Group Work: How to Use Groups Effectively

Alison Burke¹

Southern Oregon University, Ashland, OR 97520

Abstract

Many students cringe and groan when told that they will need to work in a group. However, group work has been found to be good for students and good for teachers. Employers want college graduates to have developed teamwork skills. Additionally, students who participate in collaborative learning get better grades, are more satisfied with their education, and are more likely to remain in college. This paper will discuss the use of group work in higher education.