Course Memo

CH2004 - Evaluation and Measures of the Physical Work Environment, 7.5 credits

Autumn 2023, Study period 2
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Welcome to the course on Evaluation and Measures of the Physical Work Environment!

The course deals with the topics/themes *Thermal climate and ventilation, Lighting and visual ergonomics, and Electromagnetic radiation* at the workplace. Preventive work aims to design work, workplaces, work tasks and the work environment to promote safety and health, as well as individual and organisational performance.

The course is multidisciplinary. The course design and mix of student backgrounds support mutual learning and understanding of different perspectives. We encourage new ways of approaching problems and opportunities, and reflections on how to make use of theories and methods from the course in practical applications.

The overall aim of the course is to provide knowledge about climate and ventilation, lighting and visual ergonomics, and electromagnetic radiation at the workplace, their impact on safety, health, well-being, and performance.

The objective is also to provide knowledge about how to manage these factors and reduce risks, through technical and organizational design of work, workplaces, and the work environment.

The ILOs are presented in the course syllabus and on the next page. Please plan time for your studies to make the most of the course and to balance your own workload. The course is based on constructive alignment. This means that the course objectives run like a red thread through the learning activities, and what is assessed at the examinations is whether you as a student have achieved the learning objectives for the course.

Intended Learning Outcomes (ILO)

By the end of the course, the students should be able to:

ILO 1. Describe, exemplify, and explain how all the above-mentioned factors affect safety, health, well-being, and performance.

ILO 2. Perform measurements and risk assessments relating to all the above-mentioned factors. Describe and motivate the choice of different measurement strategies; be able to interpret and draw conclusions from measurement results, be able to understand and evaluate the causes of exposure and, when required, propose countermeasures to eliminate or reduce exposure. In order to conduct measurements knowledge about measuring methods and strategies is required.

ILO 3. Propose work environment improvements according to the hierarchy of control concerning the above-mentioned factors and by reflections regarding the interactions among sociotechnical (human, technology, and organisation) perspectives.

ILO 4. Describe the EU regulations and Swedish legislation and provisions for all the above-mentioned factors and critically discuss risk assessments and work environment improvements in relation to relevant work environment regulations.

Course Design
The course consists of lectures, three mandatory laborations (Climate & Ventilation, Lighting & Visual Ergonomics, and Electromagnetic Radiation), assignments, a group project with three mandatory supervision sessions, a practical and a written exam. Instructions about how to prepare for the learning activities are presented in Canvas along with some recorded lectures on how to use some of the instruments.

Examinations

Examination	Credits	Grading	ILO
ÖVN1 - Exercises	1.0	Pass/ Fail	2
RED1 - Project Work	2.5	Pass/ Fail	1-4
TENB – Practical Exam	1.0	Pass/ Fail	2
TENA - Written Exam	3.0	A, B, C, D, E, FX, F	1-4

The examinations are further described in the coming pages. For more information see the Course syllabus.

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Venue & Schedule

The schedule is divided into *campus weeks* (weeks 45, 48, and 50) and *online weeks*. The labs (mandatory) and the exams will be held at Campus Flemingsberg, Hälsovägen 11C, in Huddinge.

Learning activities in the online weeks will be offered on Zoom, see the schedule in the scheduling program TimeEdit for details about the location. When the teaching is online only it will show up as 'Digital' in TimeEdit. Note that the three labs and two of the project supervisions are mandatory.

The Zoom link for the course is published in Canvas. Tips about Zoom is published in the first module in Canvas.

Support for Students with Disabilities

If you have a disability, you can apply for compensatory support through Funka. To learn more about how to apply visit the **FUNKA website**.

Course Literature

To prepare for the lectures and labs we recommend that you read the connected literature for each theme in the course, see the literature list in Canvas.

Be sure to have checked the literature list in advance and to have created an account on **Prevent (**with your KTH email address) to get access to the book chapters in the MOOC (online course) based on the course book: *Work and Technology on Human Terms.* Link to Prevent.

Project Work

The purpose of the project work (RED1, 2.5 credits) is to practice planning, performing, and analyzing measurements of *Thermal climate & Ventilation*, *Lighting and visual ergonomics*, and *Electromagnetic radiation*, in relation to relevant work environment regulations (including the provision AFS 2001:1 about *Systematic Work Environment Management*). Based on your results and the related provision, you will assess whether the work or work tasks constitute a work environment problem and, in such cases, suggest measures/controls to improve the work environment. This project examines Intended Learning Outcomes 1-4.

Project Management and Supervision

The project is carried out in groups of about 4 students. There are three mandatory supervision sessions planned, including one first project session (November 10th) where the groups are formed. In the next supervision all groups need to present their planned measurement strategies and get an approval before conducting the measurements. To be able to plan the measurements and present your measurement strategies you need to do a study visit to the workplace before that session. All students are expected to visit the workplace and take part in the measurements.

Estimated Workload and Expectations

The 2.5 credits for the project corresponds to about 53 study hours. The scheduled time for the project is about 12 hours. Thus, the expected time for each student's own work in the project is about 40 hours. Spread over 10 weeks that corresponds to about 4 hours/week. Some weeks more time will be needed, for example, when you make the study visit and do the measurements, and some weeks less time will be needed. *Project meetings:* The student is expected to be available for project meetings with the group at least 1 hour/week for daytime meetings between 8:00-17:00, and for the mandatory supervisions.

Examinations

The examination consists of a written report and an oral presentation (January 9th). All students in the group are expected to present the case and all students in the group need to be prepared to answer questions related to the whole presentation/report. The project is individually examined on the grading scale *Pass/Fail*. Peer-review of one other report draft is part of the examination.

Requirements for the Risk Assessments in the Project

In your report you need to refer your risk assessments to relevant provisions in the area, for example, the provision AFS 2020:1 about workplace design. Based on the regulations you need to provide answers to whether the work environment that you have assessed is acceptable or not, or whether additional measurements are needed. The assessment needs to be based on both your analysis of the technical measurements and self-reports from employees. Below you can see what areas that need to be included in the final report.

Thermal Climate & Ventilation

- This assessment needs to include at least sections 110-134 in AFS 2020:1 and need to be supported by technical measurements and self-reports from employees.

- Calculation of Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD) (for some factors, estimations may be needed), supported by technical measurements and self-reports from employees.

Lighting & Visual Ergonomics

- This assessment needs to be based on sections 9-15 in AFS 2020:1 and need to be supported by technical measurements and self-report from employees.

Electromagnetic Radiation

- Technical measurements are optional. Assessment can instead be supported from e.g., documents on work equipment (for example displays, power sources, machines).

Report Writing

The report should be written with the student's own words with support from the mandatory course literature and relevant regulation with references in the text and in a reference list at the end according to an accepted reference system. You can advantageously use APA 7th as a reference system. Detailed information about the content, the structure of the report and the overall time plan is presented in a separate instruction in Canvas.

All project reports will be checked for plagiarism. Failure to cite references in a correct manner can be interpreted as plagiarism and lead to negative consequences for you as a student. To learn more about how to steer away from plagiarism we recommend that you watch the film Avoid plagiarism and cheating [<4 min] about how to make a reference to your sources and avoid plagiarism from the KTH Centre for Academic Writing.

You can find more tips in the KTH handbook *Guiding students away from plagiarism* on how to avoid plagiarism. [Note that the English version of the book starts at Adobe page 86]. In the TTAHM Programme Room in Canvas you will find more tips about writing and referencing.

Laborations & Exercises

The exercises in the course (ÖVN1, 1 credit) consists of three mandatory on-campus laborations, and an individual assignment related to thermal climate called *Climate Report*. The grading scale is Pass/Fail. In cases where the student misses one or more labs these can be completed the next year when the course is given.

Overview of Labs

1) *Climate and Ventilation*: Measurements of Temperature, Air Velocity and Air Volume Flow.

2) *Lighting and Visual Ergonomics*: Measurements of *illuminance*, *luminance*, *flicker* and quantification of the *Daylight factor*.

3) *Electromagnetic Radiation*. Demonstration of equipment and case discussions.

Climate Report - Assignment related to Thermal Climate

The assignment related to thermal climate will be introduced in one lecture and the instructions will also be provided in Canvas. To succeed with this assignment we recommend you come to that class. After the completion of the assignments feedback on solutions will be discussed in class.

Examinations

Practical exam (TENB, 1.0 credit)
On the practical exam (December 12th) you will get to show that you can use the equipment demonstrated in the labs for *Lighting* and *Thermal Climate & Ventilation* as well as that you can identify and recognize sources of radiation. The measuring activities included are exemplified below. More details about the practical exam are provided in Canvas. Grading scale: Pass/Fail. Remember to register for the exam in Ladok.

Lighting
Measure illuminance and luminance with a standard photometer and use the data to quantify glare and daylight in different ways.

Climate & Ventilation
Use some computer programs regarding climate calculations.
Use instruments to quantify the ventilation rate and volume flow.

Radiation
Identify and assess sources of radiation.

Written exam (TENA, 3.0 credits)
The written examination on campus (January 11th) consists of three themes (*Lighting, Optical Radiation & Visual Ergonomics, Thermal Climate & Ventilation, and Electromagnetic Fields*) related to the intended learning outcomes. The grading scale is A-F, including Fx. To get a grade of least E, all parts must have a score of ≥50%.

Fx – If the total score is approximately or above the points for E-level AND the student is close to E-level (passing) for one of the intended learning outcomes (ILOs) the student will get the grade Fx which gives the student an opportunity to do an additional assignment related to that particular theme/ILO. The highest grade for the exam when completed via an Fx-assignment is E. After the additional assignment has been published the student has 15 working days to complete it.

Remember to register for the exam in Ladok by December 14th.

Raising a Passing Grade

In this course it is possible to attempt to raise a passing grade once. This is then done in connection with the regular exam or re-exam, provided that there are seats available and more students are taking the exam. You need to use this KTH form to apply for the possibility to raise your grade *and* send an email to the examiner (malinhak@kth.se).

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Master program in Technology, Work, and Health
CH2004 - Evaluation and Measures of the Physical Work Environment

Communication
Important updates about the course are announced in Canvas using *Announcements*. We advise you to regularly check Canvas for any updates to this information and to adjust the settings for notifications from the course to suit your needs so you don't miss out on important information (see the guide on this Canvas page).

You are welcome to contact us via email, but we encourage you to use a discussion forum in Canvas for general questions regarding the course.

We hope you will enjoy the course and learn a lot!

/Malin Håkansson on the behalf of teaching team