

CIVIL-450

Thermodynamics of comfort in buildings

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Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.
Civil engineering minor	E	Opt.
Mechanical engineering	MA2, MA4	Opt.
Minor in Integrated Design, Architecture and Sustainability	E	Opt.

Language of teaching	English
Credits	3
Withdrawal	Unauthorized
Session	Summer
Semester	Spring
Exam	During the semester
Workload	90h
Weeks	14
Hours	3 weekly
Courses	1 weekly
TP	1 weekly
Lab	1 weekly

Number of positions

Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription.

Summary

This course provides an integrated approach to analyzing human thermal comfort and heat exchange by examining the correlation between thermodynamic processes in buildings, human thermoregulation, and the local thermal sensation of occupants.

Content

- Overview of the heat exchange between humans and the environment
- Definition of thermal comfort, its fundamentals, and objective characterization
- Building-environment interaction, exergy analysis
- Integrated analysis of the thermal environment and thermal sensation via lab measurements

Keywords

Human thermal comfort, heat transfer, energy and exergy analysis, indoor climate control

Learning Prerequisites**Recommended courses**

- General physics: thermodynamics (PHYS-106)
- Building physics (PHYS-118)
- Thermodynamics and energetics (ME-251)

Important concepts to start the course

Background knowledge in heat transfer

Learning Outcomes

By the end of the course, the student must be able to:

- Characterize local thermal environment and comfort
- Carry out measurements of indoor comfort and energy performance using diagnostic instrumentation
- Take into consideration the effect of various modes of heat transfer on human body

Transversal skills

- Communicate effectively, being understood, including across different languages and cultures.

Teaching methods

Lectures, laboratory sessions, and group work. Two labs are organized in March and May.

Expected student activities

Laboratory measurements at EPFL-Fribourg combined with group work.

Assessment methods

Two lab reports and presentations

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

- Lecture notes (primary source)
- P. O. Fanger, Thermal Comfort, Danish Technical Press, 1970
- K. Parsons, Human thermal environments : the effects of hot, moderate, and cold environments on human health, comfort, and performance;
- Y. A. Çengel, A. J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, McGraw Hill Education, 5th edition

Ressources en bibliothèque

- [Find the references at the Library](#)

Moodle Link

- <https://go.epfl.ch/CIVIL-450>

Prerequisite for

Master projects