

CIVIL-479

Building physics

Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.
Civil engineering minor	E	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Remark

Pas donné en 2024-25

Summary

The course presents the fundamentals of how a building interacts with its environment in terms of energy, heat, air movement, and moisture. The theory is used to explain the principles of well-performing new and retrofitted building designs in addition to the diagnosis of failing performance.

Content

Energy and moisture conservation; steady-state and transient heat, moisture, and air transfer in building materials; coupled effects (heat and mass transfer); hygrothermal properties of building materials; numerical methods (finite difference, finite element, finite volume approximations).

Keywords

Heat and mass conservation and transport, building materials, hygrothermal performance of buildings

Learning Prerequisites**Required courses**

Energy and comfort in buildings ENG-445

Recommended courses

General physics: thermodynamics PHYS-106

Important concepts to start the course

Heat and mass transfer

Learning Outcomes

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

- Formulate heat, air, and moisture balances for the analysis of hygrothermal problems.
- Apply the transport equations of heat, air, and moisture in building components and zones.
- Classify building materials regarding their hygrothermal properties, and their effect on the energy performance of buildings.
- Apply mathematical methods for solving hygrothermal problems related to buildings.

- Design hydrothermally functional building components and diagnose non-performant solutions.

Transversal skills

- Access and evaluate appropriate sources of information.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Demonstrate the capacity for critical thinking

Teaching methods

Lecture presentations, exercises.

Expected student activities

Practice exercises, participate in discussions and group work

Assessment methods

2 written tests (30% + 30%) and a group project (40%)

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

S. Medved, Building Physics: Heat, Ventilation, Moisture, Light, Sound, Fire, and Urban Microclimate, Springer

Websites

- <https://link.springer.com/book/10.1007/978-3-030-74390-1>

Moodle Link

- <https://go.epfl.ch/CIVIL-479>

Prerequisite for

master projects involving knowledge in building physics