ME-341

Heat and mass transfer

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Cursus	Sem.	Type
Civil Engineering	BA6	Opt.
Energy Science and Technology	MA2, MA4	Opt.
Mechanical engineering minor	E	Opt.
Mechanical engineering	BA6	Obl.
Space technologies minor	E	Opt.

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

Summary

This course covers fundamentals of heat transfer and applications to practical problems. Emphasis will be on developing a physical and analytical understanding of conductive, convective, and radiative heat transfer.

Content

1. Introduction, to types of heat transfer. Conduction, radiation, convection.
2. One-dimensional, and two dimensional steady state, conductive heat transfer.
3. Transient conductive heat transfer.
4. Convective heat transfer for external flows.
5. Convective heat transfer for internal flows.
6. Natural convection.
7. Fundamentals of boiling and bondensation
8. Heat exchangers: Types of heat exchangers, efficiency, thermal design methods.
9. Radiation: black bodies, grey bodies, form factors of surfaces, enclosures.

Keywords

Heat transfer, conduction, convection, thermal radiation

Learning Prerequisites

Recommended courses

- Fluid mechanics
- Thermodynamics and Energetics I

Important concepts to start the course

- Boundary layer concept
- Open and closed systems energy balance
- Internal energy and enthalpy concepts

Learning Outcomes

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

- Model Systems involving heat transfer in various forms
- Explain and apply the concepts of heat and mass transfer, E3
- Design and calculate heat exchangers, E14
- Compute temperature profiles and heat transfer rates

Teaching methods

The course is organized with lectures and problem working sessions

Assessment methods

Written exam

Resources

Bibliography

The reference book for the course is:
Fundamentals of Heat and Mass Transfer 6th Edition- by Frank P. Incropera (Author), David P. DeWitt (Author), Theodore L. Bergman (Author), Adrienne S. Lavine (Author)
An alternative reference book is "A Heat Transfer Textbook" : John H. Lienhard IV and John H. Lienhard V, http://web.mit.edu/lienhard/www/ahtt.html

Ressources en bibliothèque

- A Heat Transfer Textbook / Lienhard
- Fundamentals of Heat and Mass Transfer / Incropera

Moodle Link

- https://go.epfl.ch/ME-341