

Heat Exchangers (6020-M)

5 ECTS

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Lectures: 30h | Tutorials: 6h | Labs: 24h | Project: 0h | Lang.: 

Objectives

The main objective of the subject is to provide student with knowledge in a domain of heat exchangers and their applications. With the knowledge obtained from the field of heat exchangers student will gain:

- basic knowledge for dimensioning and calculation analysis of heat exchangers;
- attain knowledge for appropriate selection and integration of heat exchanger in process and energy systems;
- attain abilities, which are needed for reduction of energy consumption in process and energy technologies, with the appropriate selection of heat exchangers;
- attain abilities, required for appropriate maintenance of systems with heat exchangers;
- attain basic knowledge on planning and design of experimental testing of heat exchangers;
- attain abilities for design of measurement systems for pressure testing, leak tightness testing, determination of pressure losses, and determination of heat exchanger efficiency.

Programme

1. Classification of heat exchangers
2. Methods for dimensioning of heat exchangers
3. Pressure drop analysis
4. Enhanced heat transfer in heat exchangers
5. Two-phase flow heat exchangers (condensers, evaporators, heat pipes)
6. Planning and managing of experimental testing of heat exchangers
7. Measurement systems and procedures in experimental testing of heat exchangers

Prerequisites

In order to achieve the objectives successfully, the students must have:

- Good knowledge in heat transfer
- Basic knowledge in metrological characteristics of measurement systems

Learning outcomes

After attending this course, the student will:

- Deep theoretical, methodological, and analytical knowledge from the field of heat exchangers and their testing, which can be transferred and supplement to other domains of process industry for high quality basic and applied research.
- Attaining of transferrable skills – which are not related only to one subject – and which enable systematic approach in analysis of the subject from the field of heat exchangers.
- Ability of unique innovations and critical reflections in the field of process and environmental engineering.

Assessment

- Theory - from lectures and exercise problems (50%)
- Individual/group work at exercises (25%)
- Practical seminary work (25%)

Literature

- S. Kakaç, H. Liu, A. Pramuanjaroenkij, Heat Exchangers: Selection, Rating, and Thermal Design, Third Edition, 2012
- Ramesh K. Shah, Dusan P. Sekulic, Fundamentals of Heat Exchanger Design, 2003
- Donatello Annaratone, Handbook for Heat Exchangers and Tube Banks design, 2010
- W. Roetzel, X. Luo, D. Chen, Design and Operation of Heat Exchangers and their Networks, Academic Press, 2019
- Tropea, C., Yarin, A.L., Foss, J.F. (ur.): Springer handbook of experimental fluid mechanics. Springer, 2007
- Baker, R. C.: Flow measurement handbook: industrial designs, operating principles, performance, and applications. Cambridge University Press, 2009