

## Heat Transfer

Code: 102440  
ECTS Credits: 4

2024/2025

Degree	Type	Year
2500897 Chemical Engineering	OB	3

### Contact

Name: David Gabriel Buguña

Email: david.gabriel@uab.cat

### Teaching groups languages

You can view this information at the [end](#) of this document.

### Prerequisites

It is recommended to have passed the following subjects:

- Basic Operations of Chemical Engineering
- Applied thermodynamics

### Objectives and Contextualisation

The objective of the subject is the study of the principles of heat transmission and its application to the calculation and design of heat exchangers and evaporators.

### Competences

- Demonstrate knowledge of the different reaction, separation and processing operations for materials, and transport and circulation of fluids involved in the industrial processes of chemical engineering.
- Develop personal attitude.
- Develop thinking habits.
- Objectively compare and select different technical options for chemical processes.
- Work in a team.

### Learning Outcomes

1. Develop a capacity for analysis, synthesis and prospection.
2. Develop curiosity and creativity.
3. Develop scientific thinking.
4. Identify the fluid circulation operations involved in the design of heat transmission systems.
5. Objectively compare and select the different technical options for heat transmission systems.
6. Work cooperatively.

## **Content**

THEME 1: Introduction to Heat Transfer

Energy of a system: total energy, heat energy and mechanical energy.

Transmission mechanisms: conduction, convection and radiation

Heat energy transmission and Chemical Engineering

THEME 2: Heat transfer by conduction in solids

Steady state conduction

Estimation of properties: thermal conductivity and diffusivity

Resistances in series

Radial conduction

THEME 3: Convection heat transfer

Individual heat transfer coefficient and dimensionless modules

Determination of individual coefficients

Heat transfer in a fluid without phase change

Heat transfer in a fluid with phase change: condensation of vapors, boiling of liquids.

THEME 4: Fundamentals of heat exchangers

Fluid-fluid heat transfer through a wall

Overall heat transfer coefficient

Fouling factors

Design equations of concentric tube heat exchangers

THEME 5: Description and design of heat exchangers

Classification and description of heat exchanger configurations

General methods of heat exchanger calculations

Design by the Kern method

THEME 6: Description and design of evaporators

Classification, description and operation of evaporators

Single effect evaporators

Multiple effect evaporators

## **Activities and Methodology**

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Title	Hours	ECTS	Learning Outcomes
Type: Supervised			
Tutorials	38	1.52	1, 2, 3, 4, 5, 6
Type: Autonomous			
Homeworks	20	0.8	3, 4, 5
Literature search	4	0.16	3, 4, 5
Solving practical exercises	24	0.96	3, 4, 5, 6
Study	10	0.4	3, 5, 6

This subject has been deprogrammed from the teaching calendar when the new Chemical Engineering degree came into operation. Tutoring sessions at the request of students will replace unscheduled teaching

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Heat Exchanger design Homework	15	0	0	1, 2, 4, 5, 6
Partial 1	45	2	0.08	1, 2, 3, 4, 5
Partial 2	40	2	0.08	1, 2, 3, 4, 5

Please, refer to the catalan version of the Heat Transfer Syllabus for further details

## Bibliography

Procesos de transferencia de calor

D. Q. Kern, Compañía Editorial Continental.

Chemical Engineering. Volume 6. Design.

J. M. Coulson. J.F. Richardson. Editorial Pergamon Press.

Flujo de fluidos. Intercambio de calor.

O. Levenspiel. Editorial Reverté.

A Heat Transfer textbook

John H. Lienhard IV; John H. Lienhard V. Editorial PHLogiston Press.

The properties of gases and liquids

R.C. Reid, J.M. Prausnitz, B.C. Polling, 4th Edition. McGraw-Hill.

Modelling in Transport Phenomena

I.Tosun, Editorial Elsevier, 2002

Transport Processes and Separation Process Principles

C.J. Geankoplis, Editorial Prentice Hall.

The Chemical Engineering Guide to Heat Transfer

Volume I: Plant Principles.

Volume 2: Equipment.

Editorial McGraw-Hill.

Perry's Chemical Engineering Handbook

Perry, R. H. Editorial McGraw-Hill.

## **Software**

The software used will be:

- Browsers: Any is valid and will be used mainly for querying property data
- MS Excel: for the use of the exchanger design spreadsheet

## **Language list**

Information on the teaching languages can be checked on the CONTENTS section of the guide.