

**Module Description, available in: EN**

## *Two-phase flows with heat and mass transport*

**General Information****Number of ECTS Credits**

3

**Module code**

TSM\_TwoPhase

**Valid for academic year**

2023-24

**Last modification**

2021-02-12

**Coordinator of the module**

Daniel Weiss (FHNW, daniel.weiss@fhnw.ch)

**Explanations regarding the language definitions for each location:**

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne			Lugano	Zurich		
<b>Instruction</b>					X E 100%		
<b>Documentation</b>					X E 100%		
<b>Examination</b>					X E 100%		

**Module Category**

TSM Technical scientific module

**Lessons**

2 lecture periods and 1 tutorial period per week

**Entry level competences****Prerequisites, previous knowledge**

Students should have a keen interest in transport phenomena and their description and modelling. Advanced knowledge of thermodynamics, fluid dynamics, heat transport and applied mathematics (ordinary and partial differential equations, algebraic equations, integral calculus) is of great benefit for students.

**Brief course description of module objectives and content**

This module deals with transport phenomena at postgraduate level with a focus on technical problems in material, heat and momentum transport, especially in the environment of multiphase flows. Working on the basis of conservation principles, transport equations are derived in a general form. In order to obtain closed solutions for specific problems, the general balance equations are combined with material laws and also with initial and boundary conditions. This then highlights the analogies and relations between transport phenomena in different technical fields. In this way, students expand the knowledge and skills in thermodynamics, fluid dynamics and heat transport that they have acquired during their

undergraduate studies and apply them to solving technical problems of practical relevance.

## Aims, content, methods

### Learning objectives and acquired competencies

Upon successful completion of the module

- students are familiar with the most important phenomena of mass, heat and momentum transport (this is the aim pursued in contact teaching, in particular.)
- the students can independently study similar topics in greater depth (this is the aim pursued through the self-study of selected chapters, in particular.)
- students are able to apply the methods covered to actual technical problems (this is the aim of the exercises between the contact lessons, in particular.)
- students are in a position to conduct analyses independently.

### Contents of module with emphasis on teaching content

The first half deals with general transport phenomena (with the focus on mass transport).

The second half covers phenomena with multiphase flows.

### Teaching and learning methods

Frontal teaching, incorporating examples (lectures with 3 lessons)

Self-study of selected chapters from different sources

Between the lectures, exercises are to be solved; these will, if necessary, be discussed in class afterwards.

### Literature

Experience has shown that the subjects cannot be covered by a single book. Instead, students are told to consult various books.

Selected sources are made available electronically:

- presentations from frontal teaching
- selected chapters from textbooks
- selected original works

## Assessment

### Certification requirements

Module does not use certification requirements

### Basic principle for exams

**As a rule, all the standard final exams for modules and also all resit exams are to be in written form**

### Standard final exam for a module and written resit exam

Kind of exam

written

Duration of exam

120 minutes

Permissible aids

*Aids permitted as specified below:*

Permissible electronic aids

pocket calculator

Other permissible aids

All documents

### Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted