

# Modeling and design of multiphase systems and reactors

## Lecturers

Pierre COLINET (Coordinator) and Senthil PARIMALANATHAN

## Course mnemonic

CHIM-H402

## ECTS credits

6 credits

## Language(s) of instruction

English

## Course period

Second term

## Course content

Phenomenology of multiphase systems; Basic hydrodynamic instabilities in systems with interfaces; Basic equations and boundary conditions for describing transport phenomena in systems involving deformable interfaces between different (liquid, gas or solid) phases; Description of phase change processes (evaporation/condensation, solidification/melting); Basic bifurcation theory; Linear stability analysis

## Objectives (and/or specific learning outcomes)

The objectives of the first part of the course (P. Colinet) are: i) to get acquainted with the rich phenomenology of multiphase systems, with a view to major fundamental questions and applications; ii) to learn/review basic equations and boundary conditions describing transport phenomena in multiphase systems with interfaces; iii) to solve these systems of equations in practical cases : droplets, bubbles and thin films with heat transfer, evaporation, solidification, ...

## Teaching method and learning activities

Theoretical lectures, exercises, and "numerical laboratories" (using commercial codes, e.g. COMSOL multiphysics)

## Contribution to the teaching profile

This teaching unit contributes to the following competences:

- > In-depth knowledge and understanding of exact sciences with the specificity of their application to engineering
- > In-depth knowledge and understanding of integrated structural design methods in the framework of a global design strategy

- > In-depth knowledge and understanding of the advanced methods and theories to schematize and model complex problems or processes
- > Reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity)
- > A creative, problem-solving, result-driven and evidence-based attitude, aiming at innovation and applicability in industry and society
- > The flexibility and adaptability to work in an international and/or intercultural context

## References, bibliography and recommended reading

R.B. Bird, W.E. Stewart and E.N. Lightfoot, Transport Phenomena, Wiley, Singapore, 1960.

G. Nicolis, Introduction to Nonlinear Science, Cambridge University Press, Cambridge, 1995.

## Other information

### Contact(s)

Pierre Colinet (email : pcolinet@ulb.ac.be)

## Evaluation method(s)

written examination

### Evaluation method(s) (additional information)

Written exam

### Determination of the mark (including the weighting of partial marks)

Written exam

## Main language(s) of evaluation

English

## Programmes

### Programmes proposing this course at the Brussels School of Engineering

MA-IRMA | Master of Science in Chemical and Materials Engineering | finalité Professional/unit 1