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, exercices, 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