



## MAPR2145 Process Simulation

[30h+15h exercises] 4 credits

This course is taught in the 2nd semester

**Teacher(s):** Denis Dochain, Fernand Thyron  
**Language:** French  
**Level:** Second cycle

### Aims

Introduction to simulation techniques, to flowsheeting and to process optimisation.

### Main themes

The main themes considered in this course are :

- the general structure and operating mode of a simulation software for processes involved in matter transformation ;
- the solution of a simulation flowsheet
- the application of optimisation methods to processes like heat exchanger, cascade of reactors,#

### Content and teaching methods

#### 1) Basic concepts

General structure and operating mode of a process simulation software. Flowsheeting methods. Evaluation and selection of thermodynamic, kinetic and unit operation models.

#### 2) Mathematical tools

Numerical methods of integration of partial differential equations used in chemical engineering. Finite difference methods, Weighted residuals methods (orthogonal collocation).

#### 3) Numerical simulation

Solution of a simulation flowsheet. Operation principles of a software (ASPEN). Generation of thermodynamic properties, use of a software for the design of equipments and the parameter sensitivity study. Simulation of the most important unit operations.

#### 4) Optimisation

Application of optimisation methods to typical processes like heat exchangers, reactor cascade, distillation columns,#  
 Applied methods : nonlinear optimisation with constraints (e.g. generalised reduced gradient, sequential quadratic programming, Lagrange multipliers,#)

**Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)**

Evaluation : yes

### Other credits in programs

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|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| <b>BIR22/2C</b> | Deuxième année du programme conduisant au grade de bio-ingénieur : Chimie et bio-industries (Ingénierie biomoléculaire et cellulaire) | (4 credits) |           |
| <b>INCH22</b>   | Deuxième année du programme conduisant au grade d'ingénieur civil chimiste                                                            | (4 credits) | Mandatory |