

IDENTIFICATION

Course code : E3AG5PR4
ECTS : 3

DURATION

Lectures : 6
Tutorial classes : 36
Labs : 8
Total : 50

Project :
Personnal work :

ASSESSMENT

The UE is assessed through continuous assessments (CC) including written and oral exams, group evaluations (group work : integrating the APP approach, practical work) and individual evaluations. Group written deliverables. The final grade combines the grades from each activity with respective coefficients : $NF = 2/6 CC1 + 2/6 CC2 + 1/6 CC3$ (home-work) + $1/6$ (Practical Work 1 + Practical Work 2)

TEACHING MATERIALS

The UE includes theoretical courses, tutorials, practical work based on case studies and individual assignments. The UE provides teaching materials (PPT, handouts, tables, abacuses, ...) distributed by instructors.

LANGUAGE

English

CONTACT

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Modifié le : 14 juillet 2026

UE : UE5-PROD

COURSE : Food Process Engineering 1

SCOPE OF THE COURSE

OBJECTIVES

The topics covered in this teaching unit (Food Process Engineering 1) not only concern a review of some important basic concepts in agri-food processes but also present and describe the unit operations grouped according to the nature of the heat and mass transfer that occur, with the aim of treating and/or preserving the quality of the raw material and the finished product.

COMPETENCE AND SKILLS

- These topics are presented and discussed with engineering students to understand, grasp, and better reflect on the choice of unit operations/processes and to select the associated equipment.
- Enable a better understanding of the process to establish the appropriate manufacturing diagram.
- Be able to select the parameters of unit operations for treatment to maximize product quality and safety.

Targeted skills at this level :

- Establish a manufacturing diagram ;
- Select and size equipment based on the target finished product
- Conduct a test and control the proper functioning of the production line

PROGRAM

1. Properties of foods : physicochemical properties (density, viscosity, porosity, moisture, aw and pH) ; biophysical and rheological properties (viscosity, texture, rheological tests or behaviors in flow mode and in oscillatory mode (G' , G'' , ...)) ; thermal properties (thermal conductivity, specific heat, enthalpy, latent heat) ; electrical properties (electrical conductivity and dielectric properties) ; optical properties (refraction, reflection, absorption, ...),
2. Impact of processes on reaction kinetics in foods (kinetics of vitamin degradation) ;
3. Mass and energy balances in continuous regimes ;
4. Thermal conduction (steady state, heat exchanger concept, thermal resistance, critical radius of insulation), conduction in transient regime (initial conditions and boundary conditions in heat transfer problems, lumped systems, infinite, semi-infinite and finite solids, error function), heating and cooling in industrial systems ; thermal equipment used in the food industry
5. Thermal convection (introduction to Newton's law, free and forced convection, dimensionless numbers (Reynolds, Prandtl, Nusselt, Grashof), determination of transfer coefficients, phase changes)
6. Knowledge and application of heat treatment and preservation processes (appertization, pasteurization, dehydration, evaporation and concentration, and cooking)
7. Practical work (pasteurization, monitoring reaction kinetics under thermal treatment, appertization, dehydration, cooking).

BIBLIOGRAPHY

- Mafart, P. (1997). *Génie Industriel alimentaire, Tome 1 : procédés physiques de conservation*. Lavoisier Tech et Doc
- Mafart, P., Beliard, E. (2004). *Génie Industriel alimentaire, Tome 2 : techniques séparatives*. Lavoisier Tech et Doc.
- Trystram, G., Duquenoy, A., Bimbenet, J.-J. (2002). *Genie des procédés alimentaires - 2nd ed. - From fundamentals to applications*. Lavoisier.
- Bazinet, L., Castaigne, F. (2014). *Concepts de génie alimentaire - Procédés associés et applications à la conservation et transformation des aliments*. Lavoisier.
- Bimbenet, J.-J., Loncin, M. (1995). *Bases du génie des procédés alimentaires*. Lavoisier.
- *Techniques de l'ingénieur* collection.
- Journals and other works (English-language, ...).

REQUIREMENTS

- Basic knowledge in applied mathematics, physics, chemistry, rheology/fluid mechanics, heat/mass transfer, biochemistry, microbiology, food constituents.
- Knowledge of major foodborne pathogens and spoilage flora.