

IDENTIFICATION

Course code : E3AG6PR4
ECTS : 2

DURATION

Lectures : 6
Tutorial classes : 18
Labs : 8
Total : 32

Project :
Personnal work :

ASSESSMENT

- Continuous assessments and practical work grade. - Case study on refrigeration machines. - Case study on air treatment. - Number of assessments : 3; 2 hours per continuous assessment; Final grade = 1/3 CA + 1/3 homework + 1/3 practical work (+ report).

TEACHING MATERIALS

Materials provided by the instructors involved in this module. Handouts/resources on refrigeration and air treatment systems (actual sizes used in the field) made available to students.

LANGUAGE

English

CONTACT

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UE : UE6-PROD

COURSE : Complementary Physics

SCOPE OF THE COURSE

OBJECTIVES

- Understand the concepts of sizing refrigeration systems dedicated to food preservation and traceability monitoring ;
- Understand and characterize air treatment issues ;
- Evaluate selection criteria for coupled pumps and deduce potential energy efficiency in variable-flow models ;
- Acquire basic knowledge of transport phenomena (thermal, mass, momentum, etc.) occurring during unit operations and treatment processes (preservation, transformation, etc.) to understand their operation ;
- Understand and master fluid transfer sizing tools in the Agri-Food sector : viscous fluids, rheology, compressible fluids ;
- Know and choose different pumps and compressors used in the agri-food industry.

COMPETENCE AND SKILLS

This course aims to enable the future agro-industrial engineer to :

- Establish a production flowchart ;
- Select and size equipment based on the target finished product ;
- Conduct a test and verify the proper operation of the production line.

PROGRAM

1. Motor and receiver cycles
2. Refrigeration and freezing (refrigeration machines and freezing/thawing rates)
3. Psychrometric chart (Psychrometry)
4. Mass transfer : diffusion (definition of concentration units, steady-state mass transfer (Fick's 1st law), transient mass transfer (Fick's 2nd law), diffusion in the transient regime, applications of mass transfer in food processes)
5. Mass transfer by convection (dimensionless numbers, calculation of mass transfer coefficients)
6. Study of simultaneous transfer phenomena (heat and mass).
7. Fluid transfer (internal flow in pipes, external flow, boundary layer analysis, velocity profiles, study of forces acting on fluids, pressure drops, friction).
8. Practical work (refrigeration machines, industrial site visit (as a complement to practical work carried out))

BIBLIOGRAPHY

- IEC 60034-30 standard for electric motors with 4 efficiency classes.
- Techniques de l'Ingénieur collection :
 - Fluid mechanics
 - Techniques de l'Ingénieur collection - Ref : A1870 v1

REQUIREMENTS

- Thermodynamics (First and Second Laws).
- Introduction to fluid mechanics.
- Basic understanding of psychrometric chart evolutions.