

## Electrotechnique et Electronique de Puissance

### Electrotechnics and Power Electronics - 1st level

#### IDENTIFICATION

CODE : GE-3-S1-EC-Etep1  
ECTS : 4.0

#### HOURS

Lectures : 20.0 h  
Seminars : 26.0 h  
Laboratory : 12.0 h  
Project : 0.0 h  
Teacher-student  
contact : 58.0 h  
Personal work : 28.0 h  
Total : 86.0 h

#### ASSESSMENT METHOD

1 final examination - 2 hours  
2 intermediary exams - 1 hour  
1 Lab examination - 1 hour

#### TEACHING AIDS

Course and Laboratory textbooks  
PPT files on-line (moodle)

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

This CE comes under the teaching unit Etep1 (UE32) and contributes to the following skills:

1) Implement the physical properties of materials for the field of electrical engineering (level 2)

- Ability: Implement ferromagnetic materials in continuous operation.
- Ability: To model a continuous magnetic circuit.
- Ability: To implement permanent magnets in magnetic circuits.
- Ability: Implement and size an inductor.

- Knowledge: Relationships that couple electrokinetics and magnetism.
- Knowledge: Relationships that explain the forces of interaction.

2) Implement the various elements of energy production, electrical energy transmission and energy conversion (level 2)

- Sub-skill: Implement single-phase and three-phase electrical circuits

- Ability: To implement different linear dipoles in a single-phase and three-phase circuit.
- Capacity: Implement single or multi-mesh circuits in single-phase and three-phase.
- Capacity: Implement single or multi-mesh circuits in single-phase and three-phase.

- Knowledge: Calculations of line currents, apparent, active and reactive powers in single-phase and three-phase.

- Sub-skill: Implement DC machines: Shunt and series excitation machines

- Ability: Model the steady state operation of a system driven by an electrical machine.
- Ability: To calculate the electrical quantities in the windings of a machine.
- Ability: Wire, start, control the speed of an electrical machine.

- Knowledge: Know the constitution and operating principle.
- Knowledge: Understand the interactions between the rotating machine and the associated mechanical system in the four quadrants.
- Knowledge: Know the equivalent diagrams in steady state.

In addition, it requires mobilizing the following skills:

- Skills in science for the engineer:
  - Analyze a real or virtual system (or problem).
  - Exploit a model of a real or virtual system.
  - Implement an experimental approach.
  - Design a system that meets specifications.
  - Process data.
  - Communicate an analysis or a scientific approach.
- Skills in humanities, documentation and physical and sports education:
  - Know yourself, manage yourself physically and mentally.
  - Work, learn, evolve independently.
  - Interact with others, work in a team.
  - Be creative, innovate, undertake.
  - Work in an international and intercultural context.

#### CONTENT

#### INSA LYON

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- Part 1: Single-phase and three-phase electrical circuits in sinusoidal regime
- Electrical energy and its transport within a balanced single-phase and three-phase network
  - Electric power on linear loads
  - Electrical power on non-linear load
- Part 2: Magnetism
- Snap Reminders
  - Circuits and magnetic materials
  - Inductance and air gap
  - Magnet and electromagnet
- Part 3: Electromechanical conversion and DC machines
- Basics of electromechanical conversion
  - DC machine: operating principle in the 4 quadrants, modeling in steady state, starting and speed variation.

## BIBLIOGRAPHY

Luc Lasne - Electrotechnique et énergie électrique - Collection Sciences Sup DUNOD  
Cahen - Electrotechnique - Machines, Réseaux - Editions : Gauthier Villard

## PRE-REQUISITE

Scientific Bachelor level - L2

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