

Basic electrical engineering

Teaching objectives:

- Know the basic principles of electrical engineering.
- Understand the operating principle of transformers and electrical machines.

Recommended prior knowledge

Basic electricity concepts.

Subject content:

Chapter 1: Mathematical reminders on complex numbers (CN): 1 week

Cartesian form, conjugated CN, Module, Arithmetic operations on CN (addition, etc.), Geometric representation, Trigonometric form, Moivre formula, root of CN, Representation by an exponential of a CN, Trigonometric application of Euler's formulas, Application in electricity of CN.

Chapter 2: Reminders on the fundamental laws of electricity: 2 weeks

Continuous regime: electric dipole, association of R, C, L dipoles.

Harmonic regime: representation of sinusoidal quantities, average and effective values, Fresnel representation, complex notation, impedances, powers in sinusoidal regime (instantaneous, active, apparent, reactive), Boucherot's theorem.

Transient regime: RL circuit, RC circuit, RLC circuit, charging and discharging of a capacitor.

Chapter 3: Electrical circuits and power: 3 weeks

Single-phase circuits and electrical power. Three-phase systems: Balanced and unbalanced (symmetrical components) and electrical power.

Chapter 4: Magnetic circuits: 3 weeks

Magnetic circuits in sinusoidal alternating current. Self and mutual inductance. Magnetic electrical analogy.

Chapter 5: Transformers: 3 weeks

Ideal single-phase transformer. Real single-phase transformer. Other transformers (isolation, pulse, autotransformer, three-phase transformers).

Chapter 6: Introduction to electrical machines: 3 weeks

Generalities on electrical machines. Operating principle of the generator and the motor. Power and efficiency balance.

Assessment method: Continuous assessment: 40%; Final exam: 60%.

Bibliographic references: (Depending on the availability of documentation at the establishment, Internet sites, etc.)