

Electromagnetism and Optics

Calendar: 2nd semester

Contact Hours: 30h00 T + 22h50 PL + 7h50 OT

Scientific Area: Estudos Complementares

Learning outcomes of the curricular unit

. The acquisition of competences by the student can be measured on the basis of the following objectives:

- To use electromagnetism and optics basic concepts as essential knowledge to understand the phenomena and information that it will be presented during this course
- To be able to analyze electric circuits in continuous and alternate current being able to use appropriated laws for this analysis and, particularly, to be able to use three-phase currents;
- To be able to use measurement instruments
- To apply electromagnetic phenomena to analyze alternate current circuits, as well as to understand magnetic materials behavior;
- To be able to apply the laws of optics and the optical properties of materials

Syllabus

1. Electrostatic; Tension and Potential; Capacity and Condensers; Dipole; Induction; Charge Distribution Energy.
2. Stationary Electrical Currents: Definitions; Ohm's Law; Energy and Power; Kirchhoff's laws; Circuits Analysis; Practical Applications.
3. Electromagnetism Magnetic Field; Lorentz's force; Faraday's Law; Lenz's Law; Magnetic Materials; magnetization; Diamagnetism; Paramagnetism; Ferromagnetism.
4. Dielectrics Dislocation Density; Dielectric Constant; Dielectric Polarization Mechanism; Piezo and Pyroelectricity.
5. Electric alternate current: Definitions; Impedance; Efficient Values; Phasors and Phasors Diagrams; The Complexes applied to the Alternate Current; Power; Measurements Instruments; Electric Transformers and Motors; Three-phase Currents.
6. Optics: Reflection and Refraction; Refraction index; Prisms; Interferences; Absorption, Light dispersion and diffusion; Light Polarization; Malus's Law; Optics Instruments.

Demonstration of the syllabus coherence with the curricular unit's objectives

The main objective of the UC is the acquisition of skills on the part of students in relation to the fundamental concepts of magnetics and optics as fundamental knowledge to understand the phenomena and knowledge that you will use and studying during this course. To do this the concepts of electrostatic will be lectured in chapter 1, followed by chapter 2 with notions of stationary electrical currents. Notions of electromagnetism and magnetic field will be exposed to students in chapter 3, and the concepts of dielectrics will be lectured in chapter 4. Chapter 5 and 6 include the lecturing of the concepts of Electric alternate current and optics.

Teaching methodologies:

Lecture or applied theory classes will be administered, using a lecture-based approach, using for that purpose slide or overhead projector presentations. The classes were planned with the aim of stimulating the interest, reasoning and critical spirit of the students. In the applied theory classes the students will autonomously solve the exercises. The laboratory classes will be executed by groups of students with the aim of developing laboratorial skills, using acquired competences. Weekly, there will be tutorials periods for discussion, doubts explanation and analysis of the problem resolutions made by the students.

Evaluation:

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

For these basic contents to be correctly acquired by the students, it must be teaches in a solid and consistent approach. For that purpose it is necessary that basic concepts, be properly explained. Consequently, it is essential that in theoretical classes' the fundamental concepts are exposed.

The acquired knowledge can be consolidate by solving relevant amount of practical problems, either by the teacher or by the student, which is a very important reason for the presence of significant number of practical classes.