COURSE DETAILS

"FISICA GENERALE II"

SSD FIS/01

DEGREE PROGRAMME: BACHELOR DEGREE IN COMPUTER ENGINEERING

ACADEMIC YEAR: 2023-2024

GENERAL INFORMATION – TEACHER REFERENCES

TEACHER: MULTIPLE STUDY COURSE
PHONE:
EMAIL:

SEE THE STUDY COURSE WEBSITE

GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE): N.A.
MODULE (IF APPLICABLE): N.A.
CHANNEL (IF APPLICABLE): N.A.
YEAR OF THE DEGREE PROGRAMME (I, II, III): I
SEMESTER (I, II): II
CFU: 6

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")

Fisica Generale I.

PREREQUISITES (IF APPLICABLE)

None.

LEARNING GOALS

The student will acquire the basic concepts of electromagnetism, favoring the methodological and phenomenological aspects. In addition, he will acquire a conscious operational skill in solving simple exercises.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

After attending the course, the student must demonstrate that:

- understand the fundamental principles of electromagnetism and its founding laws in mathematical terms, with the
adequate integro-differential calculation tools
- know the scope of the laws governing the interaction of matter with the electromagnetic field in macroscopic and microscopic regimes and how to apply them both to the phenomena illustrated during the course and to unknown situations
- know how to describe the investigation techniques used in electromagnetism and the main application areas of its laws

Applying knowledge and understanding

At the end of the learning process the student will be able to:

- formulate explanatory hypotheses of the electrical and magnetic phenomena proposed during the course through mathematical models, analogies or physical laws;
- analyze and formalize problematic physical situations pertinent to electromagnetism with the correct use of concepts exposed to the course, applying the appropriate mathematical methods and disciplinary tools learned and relevant for their resolution, and performing, where necessary, calculations, estimates, qualitative reasoning;
- examine and process proposed and/or obtained data, also of an experimental nature, verifying their relevance to the model chosen to describe electromagnetic processes and representing them, where necessary, through graphic-symbolic language;
- argue and describe with an appropriate scientific approach solution strategies adopted in applications of electromagnetism, communicating the results obtained and at the same time evaluating their consistency with the situation
Proposed problem.

COURSE CONTENT/SYLLABUS

Electrical interaction phenomena. Conductors and insulators, electrification. Electric charge, conservation law, quantization. Coulomb's law. Principle of overlap.
Electric field. Charged particle motion in the presence of an electric field. Fields generated by charge distributions. Electrostatic potential**. Potential** generated by charge distributions. Electrostatic energy. Relationship between field and electrostatic potential. Calculation of the electric field generated by a dipole. Strength and mechanical moment on dipole placed in the external electric field.
Gauss's law. The flow of a vector field. Statement and simple applications of Gauss's law. Divergence of the electrostatic field.
Conductors in electric fields. Electrostatic properties of conductors. Capacitor. Energy density of the electric field.

Insulators in electric fields. Polarization of dielectrics. General equations of electrostatics in the presence of dielectrics. Electric current. Microscopic interpretation of the current. Ohm's law. Joule's law. Electric generator , electromotive force. Kirchhoff's laws. RC circuit.
Phenomena of magnetic interaction. Lorentz strength and magnetic field. Particle motion charged in uniform magnetic field. Force on a conductor traveled by current. Mechanical moment on a coil of current.
The magnetic field generated by stationary currents. The field of a coil at a great distance, magnetic dipole, magnetic moment of a coil. Gauss's law for magnetism. Ampere's law of circuitry.
Introduction to the magnetic properties of matter. Magnetization mechanisms and amperian currents. Classification of magnetic materials.
Electromagnetic induction. Faraday's law and its applications. Auto and mutual electromagnetic induction. RL circuit. Energy density of the magnetic field. Displacement current.
Maxwell's equations. Introduction to plane electromagnetic waves. Electromagnetic wave energy.

READINGS/BIBLIOGRAPHY

Textbook (e.g. Mazzoldi-Nigro-Voci, Mencuccini-Silvestrini, Halliday-Resnick, Serwey-Jevett), exercises or questionnaires to be carried out at home.

SEE THE TEACHER'S WEBSITE

TEACHING METHODS

Lectures for about 80% of the total hours and classroom exercises with simple applications of the laws of electromagnetism.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	X
only written	
only oral	
project discussion	
other	

In case of a written exam, questions refer to:		
	Multiple choice answers	X
	Open answers	X
	Numerical exercises	X

b) Evaluation pattern: The positive outcome of the written test is generally binding for access to the oral test. In the case of multiple choice tests, the number n of answers is between 3 and 4, and each selected answer contributes to the final score with normalized weight: 1 for correct choice, -1/(n-1) (negative value) for incorrect choice.