

# UE Electromagnetism

 ECTS  
3 credits

 Component  
UFR PhITEM  
(physique,  
ingénierie, terre,  
environnement,  
mécanique)

 Semester  
Printemps

- > **Teaching language(s):** English
- > **Open to exchange students:** Yes
- > **Code d'export Apogée:** PAX8ECAC

## Presentation

### Description

#### Content

1. Maxwell in a vacuum
  - Maxwell's equations
  - Notion of distribution, charge and current distribution
  - Invariances and symmetries of the EM field
  - Interface and boundary conditions
  - Electrostatic case: Coulomb law, electric potential, conductors, dipoles
  - Magnetostatic case: Biot and Savart, magnetic potential, dipoles
  - Magnetodynamic case: induction phenomenon, induced currents
  - Wave case: propagation, reflection on a plane conductor, guided waves
  - Electromagnetic energy in vacuum
2. Maxwell in matter
  - Polarization of material
  - Microscopic origin of polarization
  - Macroscopic aspects of static polarization of dielectric materials
  - Polarization charges
  - Macroscopic fields in matter, dielectric susceptibility (tensor)

- Microscopic origin of magnetization
  - Paramagnetism, diamagnetism
  - Macroscopic fields in matter, magnetic susceptibility (tensor)
  - Ferromagnetism: spontaneous magnetic order, domains, hysteresis cycles and magnetization processes
  - Electromagnetic energy in matter
3. Propagation of electromagnetic waves in materials
- Reflection, transmission, absorption and dispersion
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## Course parts

UE Electromagnetism - TD	Tutorials (TD)	10h
UE Electromagnetism - CM/TD	Lectures (CM) & Teaching Unit (UE)	15h

## Useful info

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## Campus

- › Grenoble - Scientific Polygon