# UE Ray-Matter Interaction

Niveau d'étude
Bac +4

ECTS
3 crédits

Composante
UFR Physique, Ingénierie, Terre, Environnement, Mécanique (PhITEM)

Période de l'année
Printemps (janv. à avril/mai)

## Diplômes intégrant cet élément

- Master Nanosciences et nanotechnologies

**Langue(s) d'enseignement:** Anglais

**Ouvert aux étudiants en échange:** Oui

**Code d'export Apogée:** PAX8NFAB

# Présentation

## Description

*Goal:* This course will give a general view on the topic of photon or wave interactions with matter at various energy scales and length scales.
*Content*
In the first part, we will focus on the problem of the propagation of an electromagnetic wave when the wavelength is large (UV, optical, etc.) compared to the interatomic distances. The problem of polarization of the medium in metals and in semiconductors (Drude, Lorentz, interband, etc.) will be discussed and surface plasmons which are longitudinal excitations at the SC-metal interface will be treated. Finally, we will discuss how we can localize light on length scales smaller than the wavelength (e.g. nanoparticles). This part will be completed by a section on the Kramers-Kronig relations that link reflectance to absorption. The second part of the course will focus on phenomena where the incident wavelength is much smaller, such that matter can be resolved to atomic scales. The problem of structure factors and their interpretation in terms of correlation functions (neutrons, X, etc.) will be discussed.
*References*

1. Zangwill, Modern Electrodynamics, Cambridge University Press.



Informations non contractuelles.
Dernière mise à jour le 30 juin 2026

2. D. Tanner, Optical Effects in Solids, Cambridge University Press.
3. P. Chaikin and T. Lubensky, Principles of Condensed Matter Physics, Cambridge University Press.

## Heures d'enseignement

| | | |
|---|---|---|
| CM | CM | 21h |
| CMTD | Cours magistral - Travaux dirigés | 3h |

**Période :** Semestre 8

# Infos pratiques

## Lieu(x) ville

Grenoble

## Campus

Grenoble - Domaine universitaire


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