

MICRO-420

Selected topics in advanced optics

Martin Olivier

| Cursus | Sem. | Type |
|---|----------|------|
| Electrical and Electronical Engineering | MA1, MA3 | Opt. |
| Microtechnics | MA1, MA3 | Obl. |
| Photonics minor | H | Opt. |
| Photonics | | Opt. |

| | |
|----------------------------|-----------------|
| Language of teaching | English |
| Credits | 3 |
| Session | Winter |
| Semester | Fall |
| Exam | Oral |
| Workload | 90h |
| Weeks | 14 |
| Hours | 3 weekly |
| Courses | 3 weekly |
| Number of positions | |

Summary

This course explores different facets of modern optics and photonics.

Content

- Summary of fundamental optics (ray optics, Maxwell's equations, wave optics and polarization optics)
- Material properties and optical constants
- Light scattering
- Optics of metals and plasmonics
- Gratings, stratified media and photonic crystals
- Acousto-optics
- Electro-optics
- Metamaterials.

Keywords

Maxwell's equations, optics, photonics, polarization, material constant, dispersion, light scattering, Mie scattering, plasmonics, gratings, photonic crystals, acousto-optics, electro-optics, metamaterials, nonlinear optics

Learning Prerequisites**Recommended courses**

General knowledge of fundamental optics, e.g. courses Ingénierie Optique I & II

Learning Outcomes

By the end of the course, the student must be able to:

- Analyze an optics problem
- Develop a model for this problem
- Synthesize the properties of different fundamental optical phenomena
- Elaborate a deep understanding of the underlying phenomena
- Model an optics problem using Matlab
- Explore an optical parameter range using Matlab

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Set objectives and design an action plan to reach those objectives.
- Use both general and domain specific IT resources and tools

Teaching methods

Ex-cathedra and exercises on Matlab.

Expected student activities

Read the course material beforehand, participate actively during the lecture and during the exercises with Matlab. Go through the solution of the exercises and seek feedback when necessary.

Assessment methods

Oral exam.

Resources

Ressources en bibliothèque

- [Wave optics : basic concepts and contemporary trends / Gupta](#)

Notes/Handbook

Provided on Moodle and during the lecture.