

MICRO-420

**Selected topics in advanced optics**

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<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Electrical and Electronical Engineering	MA1, MA3	Opt.
Microtechnics	MA1, MA3	Obl.
Photonics minor	H	Opt.
Photonics		Obl.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	3 weekly
<b>Number of positions</b>	

**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.