CH-360

Atoms and radiation

Puppin Michele

Cursus	Sem.	Type
Ing.-phys	MA2, MA4	Opt.
Physicien	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Oral
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Spectroscopy, i.e. measurement of the response of a system to a perturbing electromagnetic field, is one of the most important tools to study microscopic systems. This course provides the basics of spectroscopy, discussing in detail the interaction between atoms and electromagnetic radiation.

Content

- Reminder: Early concepts of the atom
- Reminder: Radiating bodies
- Emission, absorption and dispersion of light
- The spectral shapes of atomic transitions
- Spectrometers and Detectors
- Stimulated absorption and emission of radiation
- **Fundamentals of lasers**
- Fine structure in atomic spectra / Effects of external fields
- Manipulation of atoms with electromagnetic radiation
- Measurement of light
- Ultrashort optics physics
- Strong field physics
- High harmonic Generation
- Attosecond pulse production
- Attosecond experiments
- Photoelectron spectroscopy
- Molecular photoelectron spectrscopy

Keywords

Atoms, radiation, spectroscopy, laser, attosecond, high harmonic generation

Learning Prerequisites

Recommended courses

Quantum mechanics, Electromagnetism

Learning Outcomes

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

- Link classical and quantum mechanical pictures for the interaction of atoms with electromagnetic radiation

- Discuss effects of the environment on atomic spectra
- Explain the relation between atomic properties and spectroscopic line shapes
- Explain the physics behind a laser
- Explain Strong field physics
- Discuss attosecond physics
- Choose an appropriate spectroscopic technique for a given problem

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Demonstrate a capacity for creativity.
- Access and evaluate appropriate sources of information.
- Use a work methodology appropriate to the task.
- Demonstrate the capacity for critical thinking

Assessment methods

100% oral exam

Supervision

Others Office: CH H1 565

Resources

Bibliography

W. Demtröder : Laser Spectroscopy (Springer Verlag, Berlin 1997)
Hertel :Atoms, Molecules and optical physics

Ressources en bibliothèque

- Laser spectroscopy / Demtröder
- Atoms, Molecules and Optical Physics / Hertel

Notes/Handbook

Lecture notes