

PHYS-501

Nonlinear Optics

Roke Sylvie

Cursus	Sem.	Type
Microtechnics	MA2, MA4	Opt.
Photonics minor	E	Opt.
Photonics		Opt.

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

Summary

Basic principles of optics

Content

A selection of the following topics will be offered:

- Introduction / overview of nonlinear optical phenomena
- Wave description of nonlinear optical processes
- The intensity dependence of the refractive index
- Spontaneous and stimulated light scattering processes
- Electrooptic and photorefractive effects
- Optically induced damage
- Ultrafast Nonlinear processes

Keywords

nonlinear optics, second and third harmonic generation, optical fibers, solitons

Learning Prerequisites**Required courses**

During the course we will assume a basic understanding of physics and optics. As a work of reference one can use:

Grant R. Fowles, Introduction of Modern Optics

Recommended courses

Basics of optics

Learning Outcomes

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

- Assess / Evaluate nonlinear optical interactions
- Theorize about the type of possible interactions

- Analyze symmetry and related properties
- Solve the coupled wave equation
- Analyze second and third order effects
- Interpret electro-optic effects
- Interpret laser induced damage

Assessment methods

Written exam

Resources

Bibliography

R. W. Boyd, Nonlinear Optics, Ed3

Ressources en bibliothèque

- [Nonlinear Optics / Boyd](#)

Notes/Handbook

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Moodle Link

- <https://go.epfl.ch/PHYS-501>