PHYS-635 **Semiconductor photonics and quantum structures**

Grandjean Nicolas

Cursus	Sem.	Type
Photonics		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Oral
Workload	60h
Hours	**28**
Courses	28
Number of positions	

Frequency

Every 2 years

Remark

Next time Spring 2020 to be confirmed

Summary

This course gives an overview of the current trends in semiconductor nanophotonics, with an emphasis on quantum nanostructures and optical cavities. Different light-matter interaction regimes in cavity-quantum structure systems are discussed. Nanophotonic light emitting devices are presented.

Content

1) Introduction (4h)
a. Semiconductor Materials for Photonics
b. Basic physical properties
c. Optical properties – light matter interaction
2) Electronic Properties of semiconductor nanostructures (6h)
a. Quantum confinement
b. Single photon emission – photon entanglement
3) Microcavities and photonic crystals (6h)
a. Planar cavities
b. 2D photonic crystals – 1D nanobeams
4) Light-matter interaction in cavities - Cavity quantum electro-dynamics (8h)
a. Purcell effect
b. Weak and strong coupling regimes
c. Non-linear effects
5) Photonics quantum devices (4h)
a. Quantum well and quantum dot lasers
b. Nanolasers
c. Single photon emitters

Keywords

Nanostructures, photonic cavities, quantum dots, nanolasers

Learning Prerequisites

Important concepts to start the course

Solid state physics, optics