1 Overview

Module 1: Optical components fundamentals, Module 2: Surface plasmon, LSPR in metal nano-particles, applications to sensing, Module 3: Numerical tools for photonics and sensor design, Module 4: Nanophotonics, Photonic crystals and applications to on-chip optical component design.

2 Finer details

- CO1:

Review of Maxwell's equations, Boundary conditions at the interface between two media, Polarization of light-wave, TEM, TE and TM modes.

- CO2:

Origin of refractive index, Optical pulse propagation in a dispersive medium.
Ray-optics approximation, Transfer matrix method in ray-optics, Optical components and their transfer matrices: beam-splitter, polarizer, mirror etc.
Interferometers, Laser and Photodiodes.

- CO3:

Surface plasmon at metal-dielectric interface, LSPR, Plasmonic sensors.

- CO4:

Brief introduction to FDTD, numerical dispersion.
Lab 1, 2-MIT Electromagnetic Equation Propagation (MEEP)
Mini-project to start around week 9
Lab 3, 4-Designing planar and nano-particle based sensors in MEEP

- CO5:

Photonic crystals: Basic principles, Bloch's theorem, Photonic bandgap (PBG), 1D, 2D and 3D photonic crystals.
Lab 3-Introduction to MIT Photonic Bandgaps (MPB).
Lab 4-Line-defect in a 2D photonic crystal and design of on-chip optical waveguides.
Lab 5-Point-defect in a 2D photonic crystal and design of high-Q optical resonators.

3 Evaluation

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- Quiz 15
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- Mini-project 15
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