

---

## Photonic components and devices B

### Finalità

The course will deepen the study of optical devices and components for WDM telecommunication systems starting from the basic knowledge given in Componenti Fotonici A course.

New approaches and analysis tools will be provided as long as important novelty in the field of photonics and optoelectronics.

### Programma

- Introduction.
- Bragg gratings in optical fiber and dielectric waveguide. Couple mode theory.  
Applications to reflectors, wavelength selectors, dispersion compensation, add-drop filters.
- Directional couplers in optical fiber and dielectric waveguide.
- Reflection gratings. Optical spectrum analysers.
- Fabry-Perot cavity. Interferometers.
- Mach-Zehnder interferometer filters. Splitters and star-couplers, multiplexer and demultiplexer.
- Plane waves in anisotropic media; ordinary and extraordinary waves.  
Magneto-optic devices, phase retarders, polarizers, isolators and circulators; applications.
- Optical modulators. Electroabsorption, electrooptic and acoustooptic modulators.
- Semiconductor optical amplifiers - SOA.  
Applications; optical switches, wavelength converters.
- Raman amplification; physics and applications.
- Photonic crystals and band gap. Definition, technology and structures.  
Photonic crystal based devices: waveguides, junctions, curves, filters, couplers.
- Photonic crystal fibers and holey fibers.  
Definition, fabrication technology, applications in telecommunications; performances.
- Source coherence; spatial and temporal coherence.
- Finite Methods; the finite difference and the finite element method, the mode matching.  
Features and applications. Time and harmonic propagation methods.

### Attività d'esercitazione

Student will attend labs for numerical simulation and experimental activity.

### Modalità d'esame

Oral test

### Propedeuticità

Componenti Fotonici A

### Testi consigliati

B. E. A. Saleh, M. C. Teich "Fundamental of Photonics" Wiley Interscience, 1991.

P. Bassi, G. Bellanca, G. Tartarini "Propagazione ottica libera e guidata" Clueb, 1999.