Optical communications A

Finalità
Objective of the course is to provide the basic tools and understanding for the design of modern linear fiber-optic communications systems.

Programma
Historical perspective. Review of fiber propagation. Modal and chromatic dispersion. Limits on OOK systems. Chirp and its effects. Review of lasers and optical amplification. Semiconductor lasers and chirp under direct modulation. External modulators: Mach-Zehnder and electro-absorption. Chirp in external modulators. Erbium-doped and semiconductor amplifiers. The reservoir model. Noise figure. Saturation. Gain dynamics. Gain clamping. Rayleigh backscattering and the need for isolators. Physiscs of photo-detectors. PIN and APD diodes. Mathematical principles of photo-detection. Campbell's theorems. Types of OOK optical receivers. BER calculation in OOK systems. Quantum and thermal limits. Personick's formula. Power budget and margins. Penalty with chromatic dispersion and intersymbol interference. Optically amplified detection : Marcuse's formula. Masurements of Q-factor. Interferometric noise. Optimization of chains of amplifiers. Submarine links: design rules. Pre-emphasis and gain equalizaion.
For more details on lectures, please consult the Instructor's web site

Attività d'esercitazione
Session on: fiber splicing, optical amplifiers, Mach-Zehnder modulators.

Modalità d'esame
Oral

Propedeuticità
Componenti Ottici A

Testi consigliati
[1] G. P. Agrawal, ``Fiber-optic communication systems", 3rd ed. Wiley, 2002.