SC5 | Optical fibers and applications

Nouveau Programme

NIVEAU : BASIC

Publics : Technicians and engineers wishing to acquire basic knowledge and know-how in optical fibers

Prérequis : Basic knowledge in optics

Responsable(s) pédagogique(s) : Nicolas Dubreuil - Enseignant-chercheur à l'Institut d'Optique

Langue de la formation : French

Capacité maximum : 12

Prix : 2150€ HT - **Durée :** 5 days - 35 h

Objectifs

- Understanding the characteristics and the operation of both singlemode and multimode optical fibers
- Learn about the optical fiber based technologies and applications
- Implement an optical fiber based system

Thèmes abordés

Basic notions in guided optics
- Total internal reflection, guided modes

Singlemode and multimode fibers and related technologies
- Operation principles and characterizations

Applications of optical fibers
- Erbium doped fiber amplifier and laser, Raman fiber amplifier and laser
- Optical fiber communication systems
- Optical fiber sensors

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Le programme

Reminders in Optics
- Light: photon and wave optics
- Basics in guided optics
- Measurment instrumentations

Optical fibers
- Structures and characteristics
- Step-index and graded index singlemode and multimode fibers. Cutoff wavelength. Optical attenuation and chromatic dispersion.
- Dispersion shifted and compensated dispersion fibers. Polarization maintaining fibers. Photonic crystal fibers.
- Nonlinear fiber optics: optical Kerr effect, four-wave mixing, Raman and Brillouin scattering effects.

Optical fibers applications
- Laser beam transport. Pigtailed laser diodes
- Numerical optical transmission: noise detection, transmission performances, WDM systems and associated components
- Erbium doped fiber amplifiers: architectures and characteristics, broad-band source
- Nonlinear optical fiber. Raman fiber amplifier. Wide broad-band source.
- Optical fiber sensors: Constraints, temperature, pressure, acceleration measurements. Interferometric measurements.

Optical labworks
- Erbium doped fiber amplifier and laser. Optical reflectometry. Chromatic dispersion measurement in a single mode fiber
- Raman scattering effect in a silica based fiber. Brillouin scattering effect in a silica based fiber: amplification, slow light effect. Optical fiber gyroscope: measurement of the Earth speed rotation
- Set-up and characterization of a numerical transmission on a singlemode fiber: quality factor, bite error rates

Méthodologie et évaluation

Lectures and exercises
Interactive experimental demonstrations
Labworks and practise with instruments

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