

Optical Communication and Networking (RP 4.2.9)

Introduction: Concepts of digital communication including base band and broadband digital transmission, bit signal and bit-group methods, Fourier series; Fourier transforms; convolution theorem, Z-transform. (4)

Optical Communications Physics: Quantifying information; Shannon's formula for channel capacity; digital encoding of analogue signals; sampling theorem; Nyquist rate, quantization; multilevel signalling; information theory; redundancy; data compression; error detection and correction; System limitations: bandwidth, attenuation, noise, dispersion. (6)

Components: Optical Transmitter, Optical amplifier, Photoreceiver, Transmission media - free-space, twisted pair and coaxial cable, Optical Fiber (4)

Transmission System: Baseband and modulated transmission, bandwidth filtering, demodulation and signal recovery, multimode and single-mode; attenuation and dispersion; Optical MUX and DEMUX - Operating principle of multiplexors and demultiplexors, optical telecoms. (5)

Communication networks: LAN, MAN, WAN; multiplexing (TDM, WDM, SDM); packet- and circuit-switched networks; network protocols, SONET/SDH, All optical networks; Access networks; (4)

Noise and Detection: Noise in optical transmitters, amplifiers and detectors, Crosstalk in WDM system: Component, Stimulated Raman Scattering, Four-Wave mixing, etc., Bit error rate, Power Penalty. (5)

Recent Developments: Solitons; Optical Time Division Multiplexing; All optical components; Photonic Band Gap Devices.