LONDON'S GLOBAL UNIVERSITY

Electronic and Electrical Engineering

Optical Transmission and Networks (ELEC0049)

Description

This module provides the student with an advanced understanding of the physical layer of optical transmission systems and networks on different time- and length-scales. Optical networks include the description of optical networks as a set of optical links, including the principle of wavelength routing on different time-scales (static and dynamic). On optical transmission the focus is on the elements of analysis and design of point-to-point opticallyamplified transmission systems as well as access applications. This provides in-depth understanding of optical transmission system design, optical amplifiers and amplified systems and the operation of wavelength division multiplexed systems. Both linear and nonlinear sources of transmission impairments and their accumulation with distance and interaction with dispersion are analysed. The choice of modulation formats, fibre dispersion and electronic processing techniques are discussed with the aim of maximising the spectral efficiency, channel capacity and operating system margins. Optical access networks, SDH/SONET, OTN, software defined networking (SDN) and data centre interconnect networks are covered.The concepts of routing and wavelength allocation algorithms. At the end of the course, students are expected to:

- Understand the principles of optically amplified optical transmission systems, power levels, noise accumulation and the trade-off between system capacity and reach
- Carry out power budget calculations for optically amplified links
- Understand signal transmission impairments: fibre dispersion, PMD, fibre nonlinearity, including Kerr nonlinearity and stimulated Raman scattering
- Carry out calculations quantifying the effects of dispersion and nonlinearity on an optical link
- Understand the concept of spectral efficiency; appreciate the difference between symbol rate and

Key information

Year	2019/20
Credit value	15 (150 study hours)
Delivery	PGT L7, Campus-based
Reading List	View on UCL website
Tutor	Dr Robert Killey
Term	Term 2
Timetable	View on UCL website

Assessment

Written examination (main exam period): 100%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit ucl.ac.uk

bitrate, and describe the use of different modulation formats and other signal dimensions to increase capacity (such as polarization and phase)

- Clearly understand optical system performance metrics: signal-to-noise ratio, sources of noise, capacity and spectral efficiency
- Understand trade-offs between optical systems capacity and reach, choice of modulation and detection formats, and implications on system performance
- Understand and apply the principles of electronic processing (transmitter and receiver based) and the basics of coherent detection
- Describe & analyse a variety of optical network architectures: access vs core, static vs dynamic operating on different time-and length-scales
- Analyse and design network topologies and calculate their capacities
- Have the knowledge and confidence to design optical communications links and networks on different time–and distance-scales
- Describe current research trends and explain expected future directions

LONDON'S GLOBAL UNIVERSITY

Electronic and Electrical Engineering

Optical Transmission and Networks (ELEC0049)

Description

This module provides the student with an advanced understanding of the physical layer of optical transmission systems and networks on different time- and length-scales. Optical networks include the description of optical networks as a set of optical links, including the principle of wavelength routing on different time-scales (static and dynamic). On optical transmission the focus is on the elements of analysis and design of point-to-point opticallyamplified transmission systems as well as access applications. This provides in-depth understanding of optical transmission system design, optical amplifiers and amplified systems and the operation of wavelength division multiplexed systems. Both linear and nonlinear sources of transmission impairments and their accumulation with distance and interaction with dispersion are analysed. The choice of modulation formats, fibre dispersion and electronic processing techniques are discussed with the aim of maximising the spectral efficiency, channel capacity and operating system margins. Optical access networks, SDH/SONET, OTN, software defined networking (SDN) and data centre interconnect networks are covered.The concepts of routing and wavelength allocation algorithms. At the end of the course, students are expected to:

- Understand the principles of optically amplified optical transmission systems, power levels, noise accumulation and the trade-off between system capacity and reach
- Carry out power budget calculations for optically amplified links
- Understand signal transmission impairments: fibre dispersion, PMD, fibre nonlinearity, including Kerr nonlinearity and stimulated Raman scattering
- Carry out calculations quantifying the effects of dispersion and nonlinearity on an optical link
- Understand the concept of spectral efficiency; appreciate the difference between symbol rate and

Key information

Year	2019/20
Credit value	15 (150 study hours)
Delivery	UGM L7, Campus-based
Reading List	View on UCL website
Tutor	Dr Robert Killey
Term	Term 2
Timetable	View on UCL website

Assessment

Written examination (main exam period): 100%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit ucl.ac.uk

bitrate, and describe the use of different modulation formats and other signal dimensions to increase capacity (such as polarization and phase)

- Clearly understand optical system performance metrics: signal-to-noise ratio, sources of noise, capacity and spectral efficiency
- Understand trade-offs between optical systems capacity and reach, choice of modulation and detection formats, and implications on system performance
- Understand and apply the principles of electronic processing (transmitter and receiver based) and the basics of coherent detection
- Describe & analyse a variety of optical network architectures: access vs core, static vs dynamic operating on different time-and length-scales
- Analyse and design network topologies and calculate their capacities
- Have the knowledge and confidence to design optical communications links and networks on different time–and distance-scales
- Describe current research trends and explain expected future directions