COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optical communication [S1MiKC1E>KOpt]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Piotr Stępczak
piotr.stepczak@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of mathematical analysis, algebra, basic areas of physics, basics of circuit theory necessary to understand, analyze, and evaluate the operation of electrical circuits. XD

Course objective

Deepening the knowledge about modern optical links, the operation of various optical instruments used in optical transmission systems and used to process optical signals.

Course-related learning outcomes

Knowledge:
Knows the properties and characteristics of optical and optoelectronic components as well as the basic methods of design and analysis of optical links, including analog and digital links used in ICT. He knows the basic methods of designing fiber optic links and their application in telecommunications systems and the ICT industry. He has knowledge of the physical attitudes of passive and active optical elements. Understands the operation and construction of selected optical and optoelectronic components (directional couplers, modulators, photodiodes, lasers, optical filters). Knows the principles of operation of modern measuring equipment used in ICT systems.

Skills:
Can analyze requirements and specify optical link designs. Can select appropriate optical and optoelectronic components based on catalogs and application notes, and design and implement optical links. Can calculate the basic parameters of optical and optoelectronic components. Has design skills to identify problems and constraints and propose solutions to meet specific requirements. It can carry out measurements of the basic properties of optical and optoelectronic components.

Social competences:
They are aware of the need for a professional approach to the technical problems they solve and to take responsibility for the technical solutions they propose. Understands the role of optical communication in next-generation systems for signal processing and transmission.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Completion of the lecture content is in the form of a written and/or oral test. Passing the laboratory material is based on reports created during the exercise.

Programme content

The program provides knowledge of the techniques used in optical communication and optoelectronic systems used in fiber optic systems.

Course topics

Optical phenomena at the boundary of media and their description. Planar and cylindrical optical fiber. Light propagation and methods of its description. Step, gradient and single-mode optical fibers, fiber optic modes, numerical aperture and acceptance angle, cut-off wavelength, spot size, effective refractive index. Transmission parameters, light absorption and scattering phenomena accompanying propagation in quartz glass, attenuating characteristic, transmission windows and their applications, scattering phenomena in the nonlinear propagation range. Mode, chromatic and polarization dispersion, methods of description, calculation of the range of dispersion and its effect on the optical band of the XD
fiber. Optical transmission system, design elements: sequence of procedure, selection of system components, formulation of design assumptions, determination of optical power budget and available bandwidth, evaluation of SNR and BER. Fiber connecting technologies, types of permanent and detachable connectors, standards and parameters. Fiber optic cable constructions, principles and methods of their installation. Basic knowledge about multiplication methods in fiber optic links. Optical networks, specificity, types, elements, development prospects.
Laboratory exercises: mode field in cylindrical optical fiber, optical spectrum analysis, optical couplers, WDM multiplexer, fiber optic splicing, reflectometric measurement, single-wave system, WDM system.

Teaching methods

Lecture: multimedia presentation illustrated with examples with active participation and discussion of students. Laboratory: work with measuring sets - practical exercises carried out on the basis of instructions.

Bibliography

Basic:
Optical Fiber Communications, J. Senior, Principles and Practice, Prentice Hall, 1992,
Fiber optic communications, J.C. Palais, Prentice-Hall, 2005
Fiber-optic communication systems, Govind P. Agrawal, John Wiley & Sons, 2021,
Systemy i siecie fotoniczne, J. Siuzdak, WKŁ, 2009,
Pomiary w optycznych systemach telekomunikacyjnych, K. Perlicki, WKiŁ, 2002.

Additional:
Optoelektronika, K. Booth, S. Hill, WKŁ, 2001
The RP Photonics Encyclopedia: http://www.rp-photonics.com/encyclopedia.html

Breakdown of average student's workload

	Hours	ECTS
Total workload	85	3,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50