COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optotelecommunication [N1EiT1>OPTO]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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

Lecturers

Prerequisites

A student starting this course should have systematic knowledge of mathematical analysis, algebra, basic areas of physics, and the basics of circuit theory necessary to understand, analyze and evaluate the operation of electrical circuits. He should also have the ability to obtain information from indicated sources in Polish or English; be able to integrate the information obtained, interpret it and draw conclusions, and be ready to cooperate within a team.

Course objective

To familiarize students with the basic principles and techniques underlying optical communication and the transmission of optical signals in fiber-optic telecommunications systems. The lecture part of the course is based on multimedia materials and simple demonstration examples. The laboratory part, on the other hand, allows for practical testing of the operation of fiber optic systems.

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In terms of lectures: written examination after semester 5 on the content of the lecture in the form of answers to 10-15 open questions (variously scored - 2 or 3 points) covering the issues discussed during the lectures. The threshold for passing the exam: 50% of points (dst grade). The grading scale is consistent with the percentage division, i.e. from 60% of points - dst plus grade, 70% of points - db grade, etc. As an aid in preparing for the exam, students receive a set of slides presented during lectures.

In terms of laboratory exercises: the skills acquired during laboratory classes in semester 6 are verified by reports created during the exercise and a final test consisting of 6-9 questions (test and open questions scored differently - 1 or 2 points). The final grade consists of the average grade from the reports and the grade from the test.

Programme content

The program provides knowledge of the principles and techniques used in optical communication and the transmission of optical signals in optical fiber-based telecommunications systems.

Course topics

Lecture:
- Optical phenomena and their description. Planar and cylindrical optical fiber. Light propagation and methods of its description.
- Step, gradient and single-mode fibers, fiber 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, attenuation curve, transmission windows and their applications, scattering phenomena in the range
non-linear propagation.
- Mode, chromatic and polarization dispersion, methods of description, calculation of the dispersion size and its influence on the optical band of the fiber.
- LED and LD transmitting diodes, principles of operation, parameters and basic characteristics, multi- and single-mode lasers, direct and external modulation.
- PIN and APD receiving diodes, parameters and characteristics, receiver structures, noise properties, SNR calculation.
- Optical transmission system, design elements: sequence of procedures, selection of system components, formulating design assumptions, determining the optical power budget and available bandwidth, SNR and BER assessment.
- Fiber connection technologies, types of permanent and detachable connectors, standards and parameters.
- Structures of fiber optic cables, principles and methods of their installation.
- Basic information about multiplexing methods in fiber optic links and optical amplifiers.
- Optical networks, specificity, types, elements, development prospects.

Laboratory exercises:
- mode field in cylindrical optical fiber,
- optical spectrum analysis,
- optical couplers,
- fiber optic fusion,
- measurement using the reflectometric method
- digital optical transmitter/receiver,
- single-wave system,
- WDM system.

Teaching methods

Lecture: multimedia presentation, illustrated with examples and an experimental show; presentations in the form of lecture material are made available in PDF files.
Laboratory exercises: working with measuring sets - practical exercises. Each of the exercises has an instruction according to which students complete individual exercises. The instructions include a theoretical introduction and additional questions about the topics studied.

Bibliography

Crucially
1. J. Senior, Optical Fiber Communications. Principles and Practice, Prentice Hall, 1992.
2. J.C. Palais, Fiber optic communications, Prentice-Hall, 1998.
3. J. Siuzdak, Systemy i siecie fotoniczne, WKŁ, 2009.
4. K. Perlicki, Pomiary w optycznych systemach telekomunikacyjnych, WKiŁ, 2002.
Additional
1. J. Siuzdak, Wstęp do współczesnej telekomunikacji światłowodowej, WKiŁ, 1997.
2. K. Perlicki, System transmisji optycznej WDM, WKŁ, 2009.
3. K. Booth, S. Hill, Optoelektronika, WKŁ, 2001.

Breakdown of average student's workload

	Hours	ECTS
Total workload	140	6,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	90	4,00