COURSE DESCRIPTION CARD - SYLLABUS

Course name

PO 2.1.2 Zaawansowane metody transmisji optycznej w sieciach teleinformatycznych - EC 2.1.2 Advanced optical transmission methods in ICT networks

Course

Field of study
Teleinformatics

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)

Tutorials
0

Projects/seminars
0/0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Dr inż. Jan Lamperski
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Responsible for the course/lecturer:

Prerequisites

Basic knowledge of mathematics
Basic knowledge of optics, optoelectronics, photonics
Basic knowledge of fiber optic technology

Course objective

Provide theoretical and practical knowledge on advanced transmission methods in fiber optic networks. Preparation for the design, implementation and maintenance of optical systems.

Course-related learning outcomes

Knowledge

Has extensive knowledge of photonics and fiber optic technology, including the necessary knowledge for understanding the operation of optical fiber links and optical telecommunication systems
Has well-established knowledge of essential properties and an understanding of the principle of operation of optical components used in fiber optic technology
Understands limitations of systems resulting from undesirable effects occurring in fiber optic systems

Skills

Can define the requirements and architecture of a fiber optic link
He can choose the architecture, configuration, technology and elements of a fiber optic link
Can evaluate the existing realizations of fiber optic systems and is prepared to propose and implement innovative technological solutions
Can design a link that meets the requirements from the point of view of the power budget and system dynamics

Social competences

Is aware of the need for a professional approach to solved problems technical solutions and taking responsibility for the proposed technical solutions
Can form opinions on the basic challenges faced by optoelectronics and 21st century telecommunications

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified during an written test and / or oral part.

The exam topics list are sent to students via e-mail using the university's platform.

The written form is carried out in the form of a test containing from 20 to 40 questions. The test may be accompanied by an oral part verifying the level of understanding of the material covered by the test.
The test passing threshold is: 50% of the points. Final grade includes the oral part and activity during the semester showing knowledge and the ability to solve problems independently.

The practical part is assessed on the basis of reports. The final grade is the average of the grades obtained.

Programme content

1 Selected topics of photonics and quantum mechanics
2 Teletransmission properties of optical fibers. Linear effects (attenuation, chromatic dispersion, polarization mode dispersion). Nonlinear effects (self phase modulation (SPM), cross phase modulation (XPM), four wave mixing (FWM), parametric gain ...)
3 Optical multiplexing: WDM, OTDM, PolDM
4 Optical amplifiers: fiber doped, semiconductor, Raman, Brillouin, parametric gain amplifiers
5 Fiber optic IM/DD systems. IM/DD systems with optical amplifiers. Linear and nonlinear effects that limit range and bit rate.
6 Coherent system. Coherent detection modulation formats, implementation problems, quantum limit of optical noise.
Optical signal modulation formats. Phase modulation implementation. Comparison of OOK PSK tolerance to dispersion and nonlinear effects. Multilevel modulation of optical signals. Comparison of properties of fiber optic systems using different modulation configurations and formats.
Fiber optic 100/400 G systems.
7 All optical methods of signal processing.

Teaching methods

Lecture: multimedia presentation.
Practical exercises: analysis of experimental results and computer simulations.

Bibliography

Basic

- Optical Fiber Communications: Principles and Practice, J. M. Senior, Prentice Hall, N. York, 1994
- Fiber-optic Communication Systems,G. P Agrawal, Wiley-Interscience; 3rd edition, 2002
- Zarys telekomunikacji światłowodowej, J. C. Palias, WKŁ, 1991 (Fiber Optic Communications, Prentice Hall, Pearson Education, Inc., NewJersey 2005
- Applications of Nonlinear Fiber Optics, G. P. Agrawal, Academic Press 2001

Additional

- J. Siudak, Sieci fotoniczne, WKŁ, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4.0
Classes requiring direct contact with the teacher	64	3.0
Student's own work (preparation for tests, preparation for laboratory classes, preparation for exam, literature studies)	56	1.0