



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

PO 6.1.1 Pasywne sieci optyczne - EC 6.1.1 Passive Optical Networks

### Course

Field of study

Teleinformatics

Year/Semester

3/6

Area of study (specialization)

Profile of study

general academic

Level of study

first-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

0

Projects/seminars

0/0

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

dr inż. Jan Lamperski, ITM, 61 665 3809  
e-mail: [jan.lamperski@put.poznan.pl](mailto:jan.lamperski@put.poznan.pl)

Responsible for the course/lecturer:

dr Jan Lamperski, ITM, 61 665 3809  
[jan.lamperski@put.poznan.pl](mailto:jan.lamperski@put.poznan.pl)

### Prerequisites

Knowledge in the field of fiber optic technology. Knowledge of fiber optic ICT networks. Ability to work with English-language technical literature.



## Course objective

Provide students with basic knowledge of passive optical network technology.  
Developing students' skills in solving basic and design problems in the field of PON networks.  
Shaping students' skills in acquiring knowledge about ICT networks.

## Course-related learning outcomes

### Knowledge

Has knowledge of the properties and operation of passive and active elements used in passive optical networks  
Has knowledge of fiber optic systems and technology  
Has ordered and theoretically founded knowledge of the PON network

### Skills

He can make a multi-variant selection of the type and architecture of a fiber optic PON network that meets the design assumptions  
Can, in accordance with the assumptions, carry out the selection of the elements of the designed PON network  
Can analyze the transmission properties of the photonic layer of the PON network

### Social competences

Is aware of the responsibility for their own work and is able to comply with the rules of teamwork

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified on a written test or oral form.  
The set of final problems is sent to students by e-mail and / or posted on the didactic platform.

The written form is carried out as a test containing about 20 questions or may consist of an individual conceptual and design case study problem covering most of the lecture topics.  
The test threshold is: 50% of the points.

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

## Programme content

Introduction to passive optical networks - PON.  
Optical networks. Architecture of telecommunications networks. Optical layer. All-optical networks.  
The evolution of fiber optic networks.  
Basics of fiber optic telecommunications.  
Definitions and units. Optical waveguides. Fiber attenuation. Optical information capacity - dispersion effects. Nonlinear effects.



Power budget. System dynamics.  
Network optical passive components.  
Optical splitters. Optical filters. WDM Multiplexers. OADM. Optical connectors. Optical isolators.  
Cables for optical networks.  
Active elements of the PON network.  
Photodiodes and optical receivers. Transmitters, semiconductor lasers, modulators. Wavelength converters.  
Modulation and detection of optical signals.  
Direct modulation. Intensity modulators: electroabsorption, MZM. Direct detection.  
Architecture of PON networks.  
Designing a PON network.  
Requirements specification. Link power budget. System capacity - rise time budget.  
PON network installation and testing.

### Teaching methods

Lecture: multimedia presentation.  
Practical exercises: calculation examples and computer simulations.

### Bibliography

#### Basic

R. Ramaswami, K. Sivarajan, G. Sasaki Optical Networks, A Practical Perspective, Elsevier, 2010  
J. Prat, Next-Generation FTTH Passive Optical Networks, Springer, 2008  
G. Keiser, FTTH concepts and applications, John Wiley & Sons, 2006  
N. Kashima, Passive Optical Components for Optical Fiber Transmission, Artech House, 2005

#### Additional

J. Siuzdak, Systemy i sieci fotoniczne, WKŁ, 2009  
C. Palais, Fiber optic Communications, Pearson Prentice Hall, 2005

### Breakdown of average student's workload

	Hours	ECTS
Total workload	56	3.0
Classes requiring direct contact with the teacher	30	2.0
Student's own work (preparation for tests, preparation for laboratory classes, literature studies)	26	1.0