

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject (-)		Code 1010803151010834611
Field of study Communications Technologies	Profile of study (general academic, practical) general academic	Year /Semester 3 / 5
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) elective
Cycle of study: Doctoral studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: - Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) major		(university-wide, from another field) from field
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 2 100%
Responsible for subject / lecturer: dr inż. Jan Lamperski email: jlamper@et.put.poznan.pl tel. +48 61 665 3809 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Has a systematic knowledge, together with theoretical background, of optoelectronics and opto-telecommunication.
2	Skills	Is able to formulate a design specification, analyze the operation of, evaluate and compare design solutions for fiber optics communication systems. Is also able to propose the configuration and implementation of such systems.
3	Social competencies	Is aware of the main problems and challenges facing photonics and optical telecommunication in the 21st century.
Assumptions and objectives of the course: Understanding of theoretical foundations and operations of all optical processing and transmission techniques. Understanding current limitations and development trends.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. He has in-depth knowledge in the field of all optical signal processing and transmission - [SD_W02]		
Skills: 1. Able to independently formulate and verify research hypotheses - [SD_U02]		
Social competencies: 1. Can in an understandable way to disseminate knowledge of the achievements of science and technology - [UD_K03]		
Assessment methods of study outcomes		
Oral examination		
Course description		

Optical nonlinearity
 Major nonlinear effects in optical fibers
 Self-Phase Modulation (SPM)
 Cross-Phase Modulation (XPM).
 Four-Wave Mixing (FWM), parametric gain
 Nonlinear Optical-Loop Mirrors (NOLM), Sagnac type interferometers
 Mach-Zehnder configuration
 Semiconductor optical amplifiers - nonlinear properties
 Cross Gain Modulation (XGM)
 EDFA based optically controlled switches and gates
 Ultrafast optical switching techniques
 Wavelength conversion of WDM channels
 All optical multiplexing
 High-speed optical signal processing
 All-optical regeneration schemes
 SAW based optical signal processors

Advanced optical data modulation formats
 Light modulation devices: PM, IM, EAM and MZM
 Amplitude Shift Keying transmitters and receivers
 Phase Shift Keying transmitters and receivers
 DQPSK system advantages and limitations
 100G PolMux 16QAM optical system: Bandwidth limitation, Chromatic dispersion, Polarization crosstalk, LDs phase noise problems

Basic bibliography:

1. G. P. Agrawal, Nonlinear Fiber Optics, Academic Press, Londyn
2. IEEE Photonics Technology Letters, A publication of the IEEE Photonics Society
3. IEEE Journal of Lightwave Technology, A joint IEEE / OSA publication

Additional bibliography:

1. J. M. Senior, Optical Fiber Communications: Principles and Practice, Prentice Hall, N. York, 2009
2. E. Desurvire, Erbium Doped Fiber Amplifiers, John Wiley & Sons Ltd.

Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	15	
2. Selfstudy	45	
Student's workload		
Source of workload	hours	ECTS
Total workload	60	2
Contact hours	17	1
Practical activities	0	0