

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Optoelectronics and Photonics		Code 1010821171010833612
Field of study Electronics and Telecommunications	Profile of study (general academic, practical) general academic	Year /Semester 4 / 7
Elective path/specialty Computer Networks and Internet	Subject offered in: Polish / English	Course (compulsory, elective) elective
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: 1 Laboratory: 1 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 Technical sciences		ECTS distribution (number and %) 2 100% 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	Basic knowledge of mathematics, EM field theory, optics and optocommunications.
2	Skills	Skills in the field of electronic metrology.
3	Social competencies	Ability to work in a group.
Assumptions and objectives of the course: In-depth knowledge and understanding of the design, operation and features of various optical devices used in optical transmission systems and equipment for the processing of optical signals.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. The student has knowledge of the physical behavior of passive and active optical components - [-K1_W02] 2. Has knowledge of the features and possible applications of optical and optoelectronic materials - [-K1_W02, K1_W08] 3. Understands physical principles of operation and construction of the selected optical elements and optoelectronic devices (directional couplers, modulators, photodiodes, lasers, optical amplifiers, optical filters, acousto-optical cell. - [-K1_W21, K1_W08] 4. Understands the applications in which advanced photonics devices and sub-modules are used - [-K1-W24, K1_W21]		
Skills:		
1. Can define requirements and select appropriate optical elements for the specific application. - [-K1_U12] 2. Can calculate the basic parameters of optoelectronic components - [-K1_U08, K1_U20] 3. Has design skills to define problems, identifies constraints propose solutions for specific applications to fulfill performance and required specification - [-K1_U20] 4. Able to measure basic properties of optoelectronic components - [-K1_U17]		
Social competencies:		
1. Has awareness of the necessity of professional approach to solving of technical problems. - [-K1_K01] 2. Understands the role of photonics in next-generation systems for signal processing and transmission - [-K1_K04] 3. Is aware of the advantages of optical technology and necessity of transition from electronics to photonics. - [-K1_K04]		

Assessment methods of study outcomes		
Final test, colloquium, lab reports.		
Course description		
<p>Duality of light: rays, waves, electromagnetism, quanta. Polarization of light. Electro- and acousto-optic effects. Nonlinear optics. Fundamentals of quantum mechanics.</p> <p>Selected components of integrated optics: planar waveguides, coupled mode waveguides, electro-optic modulators, electro absorption (Franz-Keldysh) modulators, Mach-Zehnder type modulators, acousto-optic modulators.</p> <p>Photonic fibers.</p> <p>Optical resonators.</p> <p>Optoelectronic semiconductor materials: electrical carriers, energy band-gap structure, direct indirect semiconductors.</p> <p>Interaction of radiation with atoms.</p> <p>Basic principles of light detection and emission in semiconductors. LED spectral characteristics. Optical amplifiers. Classification and properties of semiconductor lasers. Mode locked lasers.</p> <p>Advanced modulation formats of optical signals. Wavelength conversion. All optical signal regeneration. Optical switching. Optical computers. All-optical signal processing.</p> <p>Optical Metrology. Optical frequency standards.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. Optoelektronika, B. Ziętek, UMK, Toruń, 2004 2. Optyczne przetwarzanie informacji, K. Gniadek, PWN, Warszawa, 1992 3. Optical Electronics in Modern Communications, A. Yariv, Oxford University Press, N. York, 1998 4. Pomiary w optycznych systemach telekomunikacyjnych, K. Perlicki, WKŁ, 2002 5. http://www.rp-photonics.com/encyclopedia.html 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. Wstęp do optyki, J.R. Meyer-Arendt, PWN, Warszawa, 1979 2. http://www.invocom.et.put.poznan.pl/~invocom/C/P1-9/swiatlowody_en/index.htm 		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	15	
2. Participation in classes	15	
3. Participation in labs	15	
4. Selfstudy	13	
5. Final test	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	50	2
Contact hours	35	1
Practical activities	30	1