

| STUDY MODULE DESCRIPTION FORM | | |
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| Name of the module/subject Optoelectronics and Photonics | | Code 1010811171010833612 |
| Field of study Electronics and Telecommunications | Profile of study (general academic, practical) general academic | Year /Semester 4 / 7 |
| Elective path/specialty Radio Communications | 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 | | |
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| 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 |