COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fiber-optic systems

Course

Field of study
Education in Technology and Informatics

Year/Semester
1/1

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
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30		
Tutorials	Projects/seminars	
	15	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Fundamental knowledge of general physics (in particular: optics, electricity and magnetism). Ability of solving elementary problems in general physics, ability of obtaining information from indicated sources. Understanding of necessity of extending one's own competences, readiness to take up cooperation within a team.

Course objective

1. Transferring to students the fundamental knowledge in the field of fiber optics and the applications of fiber-optic technology, within the frame described in program contents.

2. Developing the skills of solving simple problems on the basis of the knowledge acquired, as well as the ability of designing simple experimental setups.

3. Developing the abilities of self-education and team work.

Course-related learning outcomes

Knowledge

1. student can define fundamental concepts in the field of fiber optics and fiber-optic technology, within the frame of program contents - [K2_W01], [K2_W03], [K2_W06], [K2_W07].

2. student can discuss generally polarization and nonlinear effects essential for light propagation in optical fibers - [K2_W01].

Skills

1. student can use with understanding the indicated sources of knowledge (the list of basic literature references), as well as obtain knowledge from other sources (including sources in English language) - [K2_U04].

2. student can perform simple calculation of the parameters of fiber-optic systems with specified configurations - [K2_U01], [K2_U07], [K2_U08].

3. student can design simple fiber-optic systems for specified applications - [K2_U01], [K2_U07], [K2_U08].

Social competences

1. student can get actively involved in solving of the problems, unaided develop and extend his/her competences - [K2_K01], [K2_K04].

2. student can cooperate within the team, fulfill the duties entrusted within the division of work in the team, show responsibility for his/her own work as well as for the effects of the team work - [K2_K03], [K2_K04].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

W01, W02, U01 - written exam

3.0: 50.1%-70.0%

3.5: 60.1%-70.0%

4.0: 70.1%-90.0%

4.5: 80.1%-90.0%

5.0: from 90.1%

U02 - written exam, evaluation of development of the project

3.0: 50.1%-70.0%

3.5: 60.1%-70.0%

4.0: 70.1%-90.0%

4.5: 80.1%-90.0%

5.0: from 90.1%

U03 - current evaluation of student's preparation for the project classes, evaluation of development of the project

3.0 - student can properly assess, according to the instruction, the requirements concerning fiber-optic systems for specified applications

4.0 - student can unaided properly assess the requirements concerning fiber-optic systems for specified applications and select adequate elements

5.0 - student can unaided properly assess the requirements concerning fiber-optic systems for specified applications, select adequate elements, define their mutual interactions and configure the system

K01 - evaluation of student's activity within the project classes

3.0 - student exhibits moderate commitment to solving the problems, searches for solutions based on the acquired knowledge, when encouraged

4.0 - student exhibits commitment to solving the problems, searches for solutions based on the acquired knowledge

5.0 - student exhibits strong commitment to solving the problems, self-dependently searches for solutions based on the acquired knowledge, searches for additional sources of knowledge useful for solution of the problem, searches for solutions in non-standard situations

K02 - evaluation of development of the project

3.0 - student can realize his/her own tasks resulting from division of work

4.0 - student can approximately estimate the tasks intended for realization by the team, participate in distribution of tasks among the members of the team, realize his/her own tasks resulting from division of work, to a small extent support other team members in case of difficulties with realization of the entrusted tasks

5.0 - student can precisely estimate the tasks intended for realization by the team, make a rational distribution of tasks among the members of the team, realize his/her own tasks resulting from division of work, coordinate the work of the team, support other team members in case of difficulties with realization of the entrusted tasks

Programme content

1. Fundamentals of light propagation in optical fibers. Basic parameters of optical fibers

2. Linear fiber-optic components. Mode coupling in fiber-optic transmission lines

3. Polarization controllers and analyzers in fiber-optic transmission lines. Fiber-optic polarization components

4. Light propagation in peridic media, fiber-optic Bragg gratings, photonic optical fibers

5. Optical fibers doped with rare-earth ions, fiber amplifiers, fiber lasers

6. Fiber Raman amplifiers

7. Fiber-optic sensors and transducers

8. Fundamentals of nonlinear optics. General properties of nonlinear fiber-optic media

9. Nonlinear second-order frequency conversion, second harmonic generation, parametric amplification

10. Nonlinear third-order frequency conversion, third harmonic generation, four-wave mixing

11. Optical Kerr effect, self-focusing and self trapping, supercontinuum generation

12. Propagation of optical pulses in dispersive media. Solitons in fiber-optic transmission lines

13. Interconnection components in fiber-optic networks (routers, switches)

14. Fiber-optic transmission systems

Teaching methods

1. Lecture: presentation illustrated with animations and examples, solving of simple problems

2. Project: individual student's work on the project, discussion

Bibliography

Basic

1. B.E.A.Saleh, M.C.Teich Fundamentals of Photonics (2 ed.) Wiley Series in Pure an Applied Optics John Wiley & Sons, 2007

2. B.Ziętek Optoelektronika Wydawnictwo Naukowe UMK, Toruń, 2005

3. M.Karpisz, E.Weinert-Rączka Nieliniowa optyka światłowodowa Wydawnictwo Naukowo-Techniczne, Warszawa, 2009

4. Z.Kaczmarek Światłowodowe czujniki i przetworniki pomiarowe Agenda Wydawnicza PAK, Warszawa, 2006

5. G.P.Agrawal Nonlinear Fiber Optics (4 ed.) Elsevier Inc., Academic Press, 2007

Additional

1. J.Siuzdak Systemy i sieci fotoniczne Wydawnictwa Komunikacji i Łączności, Warszawa, 2009

2. K.Perlicki Systemy transmisji optycznej WDM Wydawnictwa Komunikacji i Łączności, Warszawa, 2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	88	3,0
Classes requiring direct contact with the teacher	48	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	2,0

[1] delete or add other activities as appropriate