Title	Code
Optical Fiber Communication Systems	**POZ04WTS2ICC23**
Field: **Electronics and Telecommunications**	Year / Semester: **2 / autumn**
Specialty	Course: **core**
Hours: Lectures: **2** Classes: **-** Laboratory: **1** Projects / seminars: **-**	Number of credits: **4**

Lecturer:

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Status of the course in the study program:

Obligatory course for students of Electronics and Telecommunications, specialty: Telecommunication Systems.

Objectives of the course:

To provide students with theoretical and practical knowledge and understanding of optical communication systems. To prepare students to design, operate and maintain optical fiber systems.

Course description:

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1. Optical propagation, acceptance angle, numerical aperture, optical modes, step index and graded index fibers, cut-off wavelength, single mode fibers.
2. Transmission characteristics of optical fibers: attenuation, modal, chromatic and polarisation dispersion. DWDM fibers. Photonic cristal fibers.
3. Linear and nonlinear propagation effects.
4. Passive network components. Integrated optics. Optical switching: technology and characteristics.
5. Optical sources and detectors.
6. Principles of optical amplifiers and classification. Gain and noise characteristics.
7. Application of OA to subscriber loops, trunk and undersea transmission systems.
8. Nonlinear device application of OA.
9. Multiplexing methods: WDM, TCM, SCM and OTDM.
10. Optical multiplexing and amplification as method of upgrading fiber optic transmission systems.
11. Coherent optical fiber systems. Principles of coherent detection. Modulation formats. Demodulation schemes. Noise in coherent optical systems.
12. Soliton transmission systems. Nonlinear wave motion in optical fibers. Soliton theory. Ultra high speed soliton systems.
13. Fiber optic system design methodology. Defining requirements. Component specification. System performance model and analysis. Network availability and cost performance.

List of proposed lab projects:

- Optical spectrum analyser.
- Semiconductor light sources, laser controllers
- Investigation of passive optical components.

- A/O Bragg cell ? multiwavelength generation
- Mach Zehnder fiber modulator.
- EDFA part I
- EDFA part II
- Tunable fiber ring EDFA laser.
- EDFA DWDM configuration
- State of polarization measurement
- PDL measurements
- PMD / CD measurements
- EDFA Mode-locked pulse laser
- Coherent measurement of spectral linewidth
- E/O switch

Proposed computer simulations:
- EDFA - investigating influence of parameters of optical components.
- Longitudal distribution of Er population inversion.
- Longitudal distribution of amplified signal.
- Optimization of EDF length.
- Gain clamped amplifier.
- Ring EDFA laser.
- Raman Amplifier.
- Metro Networks.
- DWDM Networks.
- Long Distance Systems.

Initial knowledge:

Optics. Optoelectronics.

Teaching methods:

Lectures, laboratory projects.

Assessment methods:

Tests, lab project reports, written exam.

Bibliography:

1. Optical Fiber Communications ? Principles and Practice, J. M. Senior, Prentice Hall, N. York, 1994
2. High Capacity Optical Transmission Explained, D. M. Spirit, John Wiley & Sons, 1995
3. Erbium Doped Fiber Amplifiers, E. Desurvire, John Wiley & Sons, 1994
4. Fiber Optic Communications Design Handbook, R. J. Hoss, Prentice Hall, 1990
5. Fundamentals of Multiaccess Optical Fiber Networks, D.J.G. Mestadagh, Art. House, 1995
6. Fiber Optic Networks, P. E. Green, Prentice Hall, 1993
7. Pomiary w optycznych systemach telekomunikacyjnych, K. Perlicki, WKŁ, Warszawa, 2002