COURSE DESCRIPTION CARD - SYLLABUS

Course name
Telecommunications systems [S2EiT2E-TIT>STELE]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/1

Area of study (specialization)
Information and Communication Technologies

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

dr inż. Michał Kasznia
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Prerequisites

Student has a systematic knowledge of mathematical analysis, algebra and theory of probability. He is able to extract information from literature, databases and other sources. Student demonstrates the ability to solve typical tasks and problems related to analysis of electrical circuits and signal analysis.

Course objective

Presentation of the basic ideas of telecommunications, the techniques and principles that underlie the analysis, design, construction and maintenance of telecommunications systems and networks.

Course-related learning outcomes

Knowledge:
1. Student knows the principles of operation of analog telecommunication systems, including modulation and demodulation techniques.
2. Student knows the principle of operation of digital transmission systems, including baseband transmission, digital modulations, signal transmission in channels, signal reception, forming the spectral properties of signals, countering channel distortions.
3. Student has a detailed, systematic knowledge, together with necessary mathematical background, of

the fundamentals of the telecommunication theory, which is necessary to understand, analyze and evaluate the operation of analogue and digital telecommunications systems.
4. Knows about development trends in telecommunication systems.

Skills:
1. Student demonstrates the ability to solve problems related to signal analysis in time domain and frequency.
2. Student is able to measure typical parameters of signals, systems and devices, in particular those used in telecommunication. Is able to choose appropriate methods to measure given electrical quantities and parameters of signals and devices. Is able to plan and perform measurements and analyze the results.
3. Is able to select the construction of devices according to technical requirements and service conditions.

Social competences:
1. Student is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.
2. Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects.
3. Is aware of the main challenges facing modern telecommunication.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Knowledge is verified by a written exam . The exam consists of 6-10 questions evaluated using points. Passing threshold: 50% of total points (it may change depending on the difficulty of the questions, how they are scored etc.).
The skills acquired during the classes are verified on the basis of written test at the end of semester and assessment of activity during the classes. The sum of points accumulated during classes translates into the final grade. Credit threshold: 51% points.

Programme content

Lecture:
Characteristics of telecommunications: social significance, historical perspective. Telecommunication system; information sources and their models and properties; the concept of a signal in telecommunications; basic techniques for transmitting signals over a distance; transmitter and receiver functions; telecommunications channel and its properties. Representation of analog signals in the time and frequency domain; complex representation of bandpass signals; deterministic and random signals; parameters and properties of random signals. Analog modulations of harmonic carrier: mathematical description of modulation and demodulation processes; implementation of modulation and demodulation processes. Pulse modulations: sampling and quantization of signals; pulse-code modulation PCM; quantization noise. Methods of speech coding. Time-division multiplexing and frequency-division multiplexing. Basics of PDH and SDH hierarchy. Digital pulse modulation and digital modulations of harmonic carrier. Representation of digital signals in the time and frequency domain; spectrum of signal and bandwidth of signal; baseband and bandpass transmission. Examples of the use of digital modulations in modern telecommunications systems.
Classes:
parameters of deterministic signals, spectral analysis of deterministic signals, parameters of random signals, spectral analysis of random signals, graphic representation of modulated signals (waveform, spectrum, vector diagrams); mathematical description of AM, DSB-SC, SSB modulation and demodulation processes; parameters of angle modulated signals; noise in frequency modulation; sampling, quantization, PCM modulation, quantization noise.

Course topics

none

Teaching methods

1. Lecture: multimedia presentations illustrated with examples and mathematical or graphic descriptions presented on the board.
2. Classes: solving tasks in the field of mathematical description of signals and mathematical description of modulation and demodulation processes of analog and digital signals.

Bibliography

Basic
1. S. Haykin, Communication Systems, Wiley
2. S. Haykin, M. Moher, Communication Systems, International Student Version, Wiley, 2010
2. B. P. Lathi, Z. Ding, Modern Digital and Analog Communication Systems, Oxford University Press, 2010
Additional
1. T. Anttalainen, Introduction to Telecommunications Nework Engineering, Artech House, 1999
2. T. Oeberg, Modulation, Detection and Coding, Wiley, 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00