COURSE DESCRIPTION CARD - SYLLABUS

Course name
Operation of communication systems [S1EiT1>EST]

Course

Field of study
Electronics and Telecommunications

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Mieczysław Jessa prof. PP
mieczyslaw.jessa@put.poznan.pl

Lecturers

Prerequisites

Students know the principles, with necessary mathematical background, theory of communication necessary to understand, analyze and evaluate the operation of analogue and digital transmission systems. Is able to extract information from Polish or English language literature, databases and other sources, is able to synthesize gathered information, draw conclusions, and justify opinions.

Course objective

The presentation of properties and operation of basic digital transmission systems used to transport information between communication network nodes. To create skills necessary to evaluate utility of different transmission systems that satisfy technical standards and user"s requirements concerning operation, administration and maintenance.

Course-related learning outcomes

Knowledge:
1. Knows the properties and principles of operation of digital communication systems, including baseband transmission, methods of carrying signals over different media, methods of signal receiving, shaping the signal spectrum, and methods of elimination of signal distortions in

communication channels.
2. Has a knowledge concerning operation, administration and maintenance of communication devices and systems.

Skills:
1. Is able to evaluate and to choose communication devices that satisfy technical requirements.
2. Is able to measure typical parameters of signals, devices, and systems used for communication. Is able to choose measurement methods, adequate to measured parameters of signals and devices, has skills to plan, implement and analyze different measurements.
3. Is able to evaluate parameters that assess the quality of transmission in various transmission lines.

Social competences:
1. Knows limitations of his/her knowledge, understands the necessity of further self-studying.
2. Is aware of the necessity to approach solving technical problems with responsibility and professionalism, knows physical and social threats that can appear as the result of irresponsible usage of communication systems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Learning outcomes are verified with a written/oral test. Test consists of 5 open questions. Answers are scored equally. Minimum number of scores to pass the exam is equal to 50%. Knowledge and skills gathered during tutorials are assessed by a written project and oral presentation of the results of this project. The final mark is the average of two marks. The assessment levels are the following: under 3 - mark 2.0, from 3 to 3.25 - mark 3.0; from 3.26 to 3,75 - mark 3.5; from 3.76 to 4.25 - mark 4.0; from 4.26 to 4.75 - mark 4.5; above 4.75 - mark 5.0.

Programme content

During the course students learn about basic properties of transmission systems used for data transmission between nodes of contemporary communication networks and the principles of administration and maintenance of such systems. During the lectures they are presented the following subjects: line codes (AMI, HDB-3, CMI, RZ, NRZ), methods of line signal regeneration, methods of timing signal recovery, methods of phase alignment, phase jitter and wander, methods of jitter and wander measurements, measures of bit error, bit error ratio (BER), evaluation of the results of measurements with the use of International communication (ITU) standards, the structure, operation and maintenance the power station supplying the power to all communication devices, manufactory measurements, measurements during the first installation of communication devices, periodic measurements, measurements in-service , out-of-service, methods of protection (1+1, 1+N, 1:1, 1:N), repair scenarios (revertive, non-revertive), PDH signals and the PDH hierarchy, positive and negative bit stuffing, maintenance procedures for PDH, foundations of Synchronous Digital Hierarchy (SDH) and its newer version, better adopted to data transmission coming from IP network, called Next-Generation SDH (NG-SDG), construction and operation of SDH multiplexers (LM, TM, ADM, DXC, REG), structure and forming the Synchronous Transport Module STM-n according ITU-T, clocks of SDH elements and their synchronization and maintenance, SDH rings, interconnection of rings - basic rules and structures, the range of OAM procedures in SDH and NG-SDH. International standards that describe the quality of connections in the SDH network.
The goal of tutorials is to prepare and implement in software/hardware chosen components of transmission systems. Students can choose subjects from early prepared teacher"s propositions or can propose his own subject, after earlier acceptance of the teacher. Among existing propositions are: an SDH multiplexer that multiplexes four 64 kb/s bit streams with bit interleaving; a coder/decoder of a chosen line code described during the lecture; timing recovery circuit for E1 bitstream; phase jitter detector detecting jitter exceeding values from in ITU-T standards; synchronization circuit for SDH multiplexer synchronized with 2048 kb/s signal; BER measurement device for E1 or STM-1; regenerator of E1 line signal; wander detector; sinusoidal jitter generator that can be used to assess the robustness of E1 interfaces to signals

with jitter; PRBS generator for E1; computer model of asynchronous mapping of E1 signals into C-12 container of SDH; computer model of CRC-4 coding; overhead generator and presenter of STM-1 frame.

Course topics

none

Teaching methods

Lecture: Multimedia presentation.
Tutorials: A combination of exercise and project method.

Bibliography

Basic
1. Sławomir Kula „Systemy Teletransmisyjne”, WKŁ, Warszawa, 2004.
2. J. Kazimierczak "Eksploatacja systemów technicznych", Wydawnictwo Politechniki Śląskiej, Gliwice, 2000.
Additional
1. R. K. Jain, „Principles of Synchronous Digital Hierarchy”, CRC Press, Boca Raton, 2013
2. S. Niziński, Elementy eksploatacji obiektów technicznych, UWM, Olsztyn, 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	35	1,00