COURSE DESCRIPTION CARD - SYLLABUS

Course name
Synchronization in communication systems and networks [S1EiT1>SwSiST]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/6

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
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points
3,00

Coordinators

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Lecturers

Prerequisites

Student has a systematic knowledge of mathematical analysis, algebra and theory of probability. He has a detailed, systematic knowledge of the fundamentals of circuit and signal theory. Student has basic principles of digital telecommunication systems. 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 techniques and functioning of the synchronization process in telecommunication systems and networks

Course-related learning outcomes

Knowledge:
1. Student has knowledge of the functioning of the phase-locked loop, its components and their analog and digital circuit implementation.
2. Student has knowledge of symbol synchronization, carrier synchronization, block synchronization and methods of their implementation.

3. Student has knowledge of the synchronization processes of the telecommunications network.
4. Student has knowledge of the sources of synchronization signals and their parameters and methods of their analysis.

Skills:
Student can analyze the operation of the synchronization subsystem in the receiver of the telecommunication system.
He can assess the quality of the synchronization signal in the telecommunication system or network.

Social competences:
1. Student is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.
2. Student demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects.
3. Student 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 knowledge and skills acquired during the tutorials are verified on the basis of grades for reports from mini-projects carried out as a team.

Programme content

The subject of synchronization and its division. Phase-locked loop for continuous and discrete signals. Analog and digital timing recovery. Analog and digital carrier recovery. PCM stream synchronization, timing, framing. Synchronization in spread spectrum systems (SS, CDMA). Synchronization in multimedia systems. Basics of synchronization of telecommunications networks. Synchronization signal model. Synchronization signal parameters. Basics of synchronization in PDH and SDH systems. Time and frequency signal sources (quartz, atomic). Measurement of the quality of synchronization signals in a telecommunications network.

Teaching methods

1. Lecture: multimedia presentations illustrated with examples and mathematical or graphic descriptions presented on the board.
2. Tutorials: tasks in the field of mathematical description of the functioning of elements of synchronization systems; quality analysis of synchronization signals; mini-projects - modeling or designing elements of synchronization subsystems working in telecommunication systems.

Bibliography

Basic
1. A. Dobrogowski, Sygnał czasu, Wydawnictwo Politechniki Poznańskiej, Poznań 2003
2. S. Kula, Systemy teletransmisyjne, WKiŁ, Warszawa, 2004
3. K. Wesołowski, Podstawy cyfrowych systemów telekomunikacyjnych, WKiŁ, 2003
Additional
1. S. Bregni, Synchronization of Digital Telecommunications Networks, Wiley, 2002
2. W. Lindsey, Synchronization Systems in Communication and Control, 1972
3. U. Mengali, A. N. D"Andrea, Synchronization Techniques for Digital Receivers, 1997
4. H. Meyr, G. Ascheid, Synchronization in Digital Communications, Vol. 1, Wiley 1990

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	31	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	44	1,00