



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Subsystems of time and frequency in communication systems [S1EiT1>PCiCwST]

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 time and frequency subsystems in modern electronics and telecommunication systems

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 sources of reference signals, their parameters and methods of their distribution.
4. Student has knowledge of methods of precise measurement of parameters of time and frequency signals.

Skills:

Student can analyze the operation of the time and frequency 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

Time and frequency. Timing signal model. Timing signal parameters. Phase-locked loop for continuous and discrete signals. Analog and digital timing recovery. Analog and digital carrier recovery. Timing recovery in PCM streams, framing. Synchronization in spread spectrum systems (SS, CDMA). Synchronization in multimedia systems. Basics of synchronization of telecommunications networks. Time and frequency signal sources (quartz, atomic). Precise measurement of the time interval. Measurement of the quality of timing signals in the telecommunications network. Time scales. Transfer of time and frequency signals.

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 time and frequency subsystems; quality analysis of timing signals; mini-projects - modeling or designing elements of time and frequency subsystems.

Bibliography

Basic

1. A. Dobrogowski, Sygnał czasu, Wydawnictwo Politechniki Poznańskiej, Poznań 2003
2. S. Kula, Systemy teletransmisyjne, WKiŁ, Warszawa, 2004
3. K. Wesółowski, 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