POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)
pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Hierarchies of digital transmission systems

Course

Field of study
Electronics and Telecommunications

Year/Semester
III/VI

Area of study (specialization)

Profile of study

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)

Tutorials
0

Projects/seminars
15

Number of credit points
3

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Mieczysław Jessa

mieczyslaw.jessa@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites
Student knows the principle of operation of digital transmission systems, digital modulations, forming the spectral properties of signals, countering channel distortions. 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.

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Course objective

The presentation of properties of basic hierarchies of data transport systems exploited in modern communication networks and to create skills to assess utility of different transmission systems in real networks.

Course-related learning outcomes

Knowledge

1. Has a wide, systematic knowledge, with necessary mathematical background, of digital transmission systems and signal transmission methods.

Skills

1. Is able to assess basic parameters and properties of data transport systems used in real networks.

2. Is able to select adequate methods to solve typical tasks related to analysis, design and optimization of transmission systems.

Social competences

1. Is aware of the limitations of his/her current knowledge and skills; is committed to lifelong learning.

2. Is aware of the necessity to approach solving technical problems with responsibility and professionalism.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes are verified with written/oral exam. Exam 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 the Project are assessed by 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 hierarchies of transport systems used for data transmission between nodes of contemporary communication networks. They are Synchronous Digital Hierarchy (SDH), its newer version, better adopted to data transmission coming from IP network, called Next-Generation SDH (NG-SDG) and Optical Transport Hierarchy, known also as Optical Transport Network (OTN). Program content includes: introduction to SDH, the layer concept, synchronous transport module, overheads structure, synchronous multiplexing, pointer justifications, virtual containers, tributary signals, SDH multiplexer, uni- and bi-directional rings, mesh network, protection in SDH, connections of ring subnetworks, mapping of tributary signals to SDH, NG-SDH and OTH, virtual concatenation V-CAT, Link Capacity Adjustment Scheme (LCAS), and Generic Framing Procedure (GFC) used in NG-SDH, multiplexing in OTH (OTN), basic data structures (OPU, ODU, OTU, OCh, OCC, OCG, OTM), the concept of optical section, data correction, comparison of NG-SDH and OTH (OTN).

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The goal of the Project is to prepare and implement in software/hardware element or elements of SDH, NG-SDH or OTH (OTN). Students can choose subject from early prepared teacher's propositions or can propose its own subject, after earlier acceptance of the teacher. Among existing propositions are: multiplexers of SDH; a circuit/software for BER assessment in RSOH or MSOH or VC-4, or VC-12; phase detector for wander and jitter measurements, computer model of synchronous multiplexing of four AU-4 into a single AU-4-4; computer model of asynchronous mapping of E1 into C-12; software/hardware model of error detection with BIP-K code, where K can assume 2, 8 or 16; header generator for STM-1 frame; simulation of V-CAT; simulation of error correction in OTH (OTN).

Teaching methods

Multimedia presentation and project method.

Bibliography

Basic

1. R. K. Jain „Principles of Synchronous Digital Hierarchy", CRC Press, Boca Raton, 2013.

Additional

1. A. Valdar „Understanding Telecommunications Networks", IET, London, 2006.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1

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[1] delete or add other activities as appropriate