



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elective course 3.2.1. 2.Synchronous hierarchy of digital systems

### Course

Field of study

Electronics and Telecommunications

Area of study (specialization)

Year/Semester

II/IV

Profile of study

Level of study

Second-cycle studies

Form of study

full-time

Course offered in

English

Requirements

elective

### Number of hours

Lecture

30

Tutorials

0

Laboratory classes

15

Projects/seminars

0

Other (e.g. online)

### Number of credit points

4

### 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 SDH and NG-SDH, 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.



### Course objective

The presentation of advanced properties of basic transmission systems exploited in modern communication networks and to create skills that are necessary to model transmission systems.

### Course-related learning outcomes

Knowledge

1. Has an advanced knowledge of digital transmission systems used in telecommunication networks.

Skills

1. Is able to model SDH and NG-SDH in a computer and assess their parameters and properties.

Social competences

1. 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 test. Test consists of 5 open questions. Answers are scored equally. Minimum number of scores to pass the test is equal to 50%. Knowledge and skills gathered during the Laboratory are assessed by final test. Minimum number of scores to pass the test is equal to 50%.

### Programme content

During the course students learn about advanced properties of SDH and NG-SDH hierarchies and about mathematical modelling of transmission systems. Program content includes: the layer concept of transmission networks, functional blocks, methods of protection, tandem connection protection, layer decomposition, partitioning methods, decomposition of a link connection, relations between model components and SDH elements, methods of SDH network design, alarms in SDH and NG-SDH, synchronization of SDH elements, time and frequency transfer via SDH and NG-SDH.

The goal of the Laboratory is to prepare and implement in software/hardware elements of SDH or NG-SDH. 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: SDH regenerator, GFP for IP packets, V-CAT of four VC-12, V-CAT of four VC-4, DP-PLL with OCXO, timing signal extractor from STM-1, FPGA based source of timing signal (SEC) for STM-1, and SSM analyzer.

### 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.
2. Application Notes gathered from Internet.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	58	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	42	2,0

<sup>1</sup> delete or add other activities as appropriate