COURSE DESCRIPTION CARD - SYLLABUS

Course name
Telecommunication Networks [S1MiKC1E>ST]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

prof. dr hab. inż. Wojciech Kabaciński
wojciech.kabacinski@put.poznan.pl

Lecturers

Prerequisites

A student knows the basic concepts of digital modulation, transmission systems, and has fundamental knowledge of probability theory and graph theory. They can obtain information from literature, databases, and other sources in Polish or English; they are capable of integrating the acquired information, interpreting it, drawing conclusions, and justifying opinions. They can communicate in Polish or English in a professional environment and in other contexts. They are aware of the limitations of their own knowledge and skills and understand the need for further learning.

Course objective

Introducing students to the basics of how telecommunications networks operate, the principles of their analysis, modeling, and design, as well as the services provided in these networks.

Course-related learning outcomes

Knowledge:
Knows the concepts that characterize telecommunications networks and understands the technical significance of these concepts.
Has an organized fundamental knowledge of the structure, functioning, and standards of various types

of telecommunications networks, the devices used in them, and communication protocols.
Knows the basics of traffic engineering, queue handling, and methods for assessing the quality of service in telecommunications networks.

Skills:
Can solve basic problems of telecommunications networks using mathematical tools, especially probability theory.
Can solve typical issues related to the parameterization of telecommunications networks and devices.
Can acquire information from literature and databases or other sources in Polish or English; can integrate the obtained information, interpret it, draw conclusions, and justify opinions.
Can communicate in Polish or English in a professional environment. Capable of self-directed learning.

Social competences:
Recognizes the limitations of their own knowledge and skills, understands the need for further education.
Has an awareness of the need for a professional approach to solving technical problems and taking responsibility for the proposed technical solutions.
Understands the responsibility for the designed telecommunications networks and is aware of the potential dangers for others or society from improper use.
Can formulate opinions on the fundamental challenges facing modern telecommunications.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge gained from lectures is assessed through a final assessmentm. The assessment is written and consists of 45-60 multiple-choice questions, true/false questions, and open-ended questions. Students receive one point for each correct answer, and a minimum of 50% of the total points is required to pass the assessment.
The knowledge and skills acquired in exercises are assessed based on student activity during classes (20%) and a final assessment (80%). The final assessment consists of 5-10 tasks to be solved, with the number of points awarded for each task depending on the complexity of the question. To pass the test, students must score at least 50% of the total points.

Programme content

Construction and operation of telecommunications networks, telecommunications services, construction and operation of network devices, basics of traffic theory

Course topics

Lectures: The concept of a telecommunications network. Information transfer methods. Types of telecommunications networks. Standardization. Topologies, models and network architectures. Nodes in telecommunications networks - structure, functions, operation (routers, switches, in packet and optical networks). Basics of traffic theory: telecommunications traffic, models, systems with losses, systems with waiting. Telecommunications services - types, description methods, quality parameters, implementation of services in networks. Optical networks.
Laboratory: As part of laboratory exercises, students can conduct research on various types and topologies of networks, evaluate their operation under various load conditions. Exercises carried out on the basis of publicly available and separately prepared simulation and demonstration programs.

Teaching methods

Lectures: Lectures are conducted in the traditional form, with computer presentations that are available earlier to students. Some lectures, or their parts, are led as interactive or problem lectures, where students participate in solving some problems or examples, especially in proving of some mathematical theorems.
Laboratory: Students conduct simulation experiments in open simulation systems or those prepared for laboratory purposes. The input data for the experiments are given at the beginning of the course. The students' task is to analyze the simulation goals, conduct them, collect and analyze the results, and draw conclusions about the operation of the network under the conditions of the conducted experiments.

Bibliography

Basic:
[1] W. Kabaciński, M. Żal: Sieci telekomunikacyjne, WKŁ, 2008.
[2] S. Rommer, P. Hedman, M. Olsson, L. Frid, S. Sultana, C. Mulligan: 5G Core Networks. Powering Digitalization. Elsevier, Academic Press, 2020.
[3] D.Chadha: Optical WDM Networks. From Static to Elastic Networks. Wiley, IEEE Press, 2019.
[4] J. F. Kurose and K. W. Ross, COMPUTER NETWORKING A Top-Down Approach, Sixth. Pearshon, 2013.
[5] H. J. Chao and B. Liu, High Performance Switches and Routers. John Wiley & Sons, Inc., 2007.

Additional:
[1] H. Akimaru and K. Kawashima, Teletraffic. Theory and Applications. Springer-Verlag, 1993.
[2] N. Benvenuto and M. Zorzi, Priniples of Communications Networks and Systems. John Wiley & Sons, Ltd, 2011.
[3] Y.-D. Lin, R.-H. Hwang, and F. Baker, Computer Networks. An Open Source Approach. McGraw-Hill, 2012.
[4] L. L. Peterson and B. S. Davie, Computer Networks. A Systems Approach, 4th ed. Morgan Kaufmann, 2007.
[5] M. Stasiak, M. Głąbowski, P. Zwierzykowski: Modelowanie i wymiarowanie ruchomych sieci bezprzewodowych. Wydawnictwo Komunikacji i Łączności, Warszawa 2009.
[6] M. Stasiak, M. Głąbowski, S. Hanczewski, P. Zwierzykowski: Podstawy inżynierii ruchu i wymiarowania sieci teleinformatycznych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2009.
[7] V.B. Iversen(ed.): Teletraffic Engineering, Handbook, ITU, Study Group 2,Question 16/2 Geneva, January 2005, on-line.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00