COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structure and operation of communication networks [S1EiT1>SiDST]

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
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

The student knows the basic concepts of digital modulation, transmission systems and has basic knowledge of probability theory and graph theory. Can obtain information from literature and databases and other sources in Polish or English; can integrate the obtained information, interpret it, draw conclusions and justify opinions. He can communicate in Polish or English in a professional environment and in other environments. He knows the limitations of his own knowledge and skills, understands the need for further training.

Course objective

Familiarizing students with the basics of telecommunications networks operation, principles of their analysis, modeling and design and the services provided on these networks.

Course-related learning outcomes

Knowledge:
He knows the terms characterizing telecommunications networks and understands the technical meaning of these terms. Has structured basic knowledge of the structure, functioning and standards of various types of telecommunications networks. He knows the basics of traffic engineering, the theory of queues, services,

devices, management systems, protocols and telecommunications techniques that are used in telecommunications networks.

Skills:
He is able to solve basic problems of telecommunications networks using mathematical apparatus, in particular probability. He can solve typical issues related to traffic engineering and parameterization of telecommunications networks and devices. can obtain information from literature, databases and 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 professional environments. he can educate yourself.

Social competence:
He knows the limitations of his own knowledge and skills, understands the need for further training. He is aware of the need for a professional approach to solving technical problems and taking responsibility for the technical solutions he proposes. Has a sense of responsibility for the designed telecommunications networks and is aware of the potential dangers for other people or society if they are not used properly. Can formulate opinions on the basic challenges faced by modern telecommunications.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge aquired during the lectures is verified by the final exam. This exam is in the oral or/and written form, depending on the number of students.
The oral exam consists of a set of 5 questions, a set of questions is drawn from at least 10 sets; answer to each question is marked in 0-10 points. 50% of points are needed to pass the exam.
The written exam consists of 45-60 questions of multiple choice type. Students get 1 point for the correct answer and 0 points for wrong answer or lack of answer. 50% of points are needed to pass the exam. An additional oral question is possible for students with a number of points close to completion.

Skills mustered during tutorial classes are evaluated by students activity (20%) and final colloquium (80%) held in the last meeting. The final colloquium contains of 5-10 problems, number of points assigned to each problem depends on the problem complexity. Colloquium is passed when student gets at least 50% of the total points. For students whose number of points is close to passing, an additional oral question is possible.

Programme content

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

Course topics

Lectures: The concept of telecommunications systems and networks. Information transfer methods. Types of telecommunications networks. Standardization. Network topologies, models and architectures. Nodes in telecommunications networks - structure, functions, operation. Circuit and packet switching - types, properties, characteristics, control, routing. Basics of traffic theory: telecommunications traffic, models, loss systems, waiting systems. Telecommunications services - types, description methods, quality of service parameters, implementation of services in networks. Handling of connections in telecommunications networks, control systems, signaling. Optical networks.

Exercises: Calculation exercises on the following topics: Network topologies. Graph algorithms in telecommunications networks. Channel switching networks - design, properties, cost assessment. Packet switching networks - design, buffering, packet scheduling for transmission. Call control. Basic concepts of telecommunications traffic. Calculating traffic intensity, determining service quality parameters - probability of losses, waiting times. State diagrams for telecommunications network systems.

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.

Classes: Students get some problems or tasks for solving individually or in groups and then presents solutions to other students.

Bibliography

Basic
[1] A. Jajszczyk: Wstęp do telekomutacji, WNT, 2009.
[2] W. Kabaciński, M. Żal: Sieci telekomunikacyjne, WKŁ, 2008.
[3] R. L. Freeman, Fundamentals of Telecommunications, 2nd ed. John Wiley & Sons, Inc., 2005. (available from PUT network: https://onlinelibrary.wiley.com/doi/book/10.1002/0471720941)
[4] A. Valdar, Understanding telecommunications networks. The Institution of Engineering and Technology, 2006.
[5] T. N. Saasawi, M. H. Ammar, and A. El Hakeem, Fundamendals of Telecommunication Networks. Wiley, 1994.
[6] J. F. Kurose and K. W. Ross, COMPUTER NETWORKING A Top-Down Approach, Sixth. Pearshon, 2013.

Additional
[1] H. Akimaru and K. Kawashima, Teletraffic. Theory and Applications. London Berlin Heidelberg New York Paris Tokyo Hong Kong Barcelona Budapest: Springer-Verlag, 1993.
[2] N. Benvenuto and M. Zorzi, Priniples of Communications Networks and Systems. John Wiley & Sons, Ltd, 2011.
[3] H. J. Chao and B. Liu, High Performance Switches and Routers. John Wiley & Sons, Inc., 2007.
[4] Y.-D. Lin, R.-H. Hwang, and F. Baker, Computer Networks. An Open Source Approach. McGraw-Hill, 2012.
[5] L. L. Peterson and B. S. Davie, Computer Networks. A Systems Approach, 4th ed. Morgan Kaufmann, 2007.
[6] M. Stasiak, M. Głąbowski, P. Zwierzykowski: Modelowanie i wymiarowanie ruchomych sieci bezprzewodowych. Wydawnictwo Komunikacji i Łączności, Warszawa 2009.
[7] M. Stasiak, M. Głąbowski, S. Hanczewski, P. Zwierzykowski: Podstawy inżynierii ruchu i wymiarowania sieci teleinformatycznych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2009.
[8] 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	90	3,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	35	1,00