GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Telecommunication Systems and Networks I, PG_00048810		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Narloch	
	Teachers	dr inż. Marcin Narloch	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	0.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	3.0	42.0	75

Subject objectives

Transfer of knowledge on the basic principles of operation of the telecommunications network, its architecture, functional elements and implementation modalities of telecommunications services in combination with different techniques of switching and transmission.

Learning outcomes

Course outcome	Subject outcome	Method of verification

Subject contents

Course content – lecture
1. Aims and the definition of the telecommunication. The explanation of basic ideas
2. The idea of the service. The information exchange system and his properties
3. The network as realization of the information exchange system. The structure and functional elements
4. Basic functions realized in the network: transmission, switching
5. Problems of the network elements cooperation and the need of the standardization
6. The classification criteria and the network characterization. Hierarchical and planar networks
7. Service networks: telephone, computer, television
8. The numbering and addressing in networks
9. The relationship between: service, call scenario, connection
10. The transfer of the information - attributes
11. The circuits, packets and cells switching
12. The idea of: teleservices, bearer services, supplementary services. Attributes and classification
13. Grade and the quality of services
14. Idea of telecommunication traffic and the traffic service resources. The Erlang formula to the calculation of the volume of resources
15. The dynamic of traffic changes and its results for the grade and quality of the traffic service
16. Resources and the optimalisation of their utilization
17. Multiplexing as the manner of the better utilization of resources. FDM, TDM, wavelengths, CDM multiplexing
18. The idea of the transmission system and his properties
19. The PCM30 system: multiplexing, signaling channels, track
20. SDH system: properties of the system, tributary streams, multiplexing and assign of streams, optical interfaces
21. WDM system: optical paths, multiplexing, optical track
22. Synchronisation problem in the transmission network; the plesiochronous, synchronous and asynchronous network
23. The distance of transmission for copper pair and optical fibres. Methods of the distance maximisation
24. The transmission network as the response on the dynamics of the traffic changes and of the reliable service warranty
25. The classification of transmission networks. Elements of the transmission network and their functionality
26. SDH rings: one- and bi-directional, the circulation of streams in rings, the capacity of the ring
27. (D)WDM rings: optical paths, the capacity of the ring
28. Control in transmission networks
29. Transmission distance and the transmission network synchronisation problems
30. Design principles of the transmission network
31. Control in telecommunication network. Service control and connection control. The routing function
32. The service scenario. Idea of the user and control information
33. ISO/OSI layered model of systems and devices cooperation. The use of the model in telecommunication
34. PSTN /ISDN operator network - technics and services integration
35. DSS1 signaling system
36. SS7 - ISUP system and network signaling
37. Example of the messages exchange scenario for the realisation of the service in PSTN/ISDN network
38. Problem of the openness on new services. The intelligent network and its services
39. Supporting of the mobility of users and its realisation in GSM operator network
40. Internet as operator network for the realization of computers connections
41. Evolution of the network: access, distribution, core
42. Wire and wireless access
43. Problems of the cooperation and convergation
44. Characterisation of access and core networks solutions
45. Perspectives of the development of telecommunication networks – NGN the next generation network and the Next Generation Internet
46. Security and tariffication problems
47. The management problem

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written examination	50.0%	100.0%

Recommended reading

Basic literature	Material prepared by the lecturer, accessed in the xeroxcopy form
Supplementary literature	Horak R. Telecommunications and data communications handbook, John Wiley & Sons, 2007
eResources addresses	

Example issues/ example questions/ tasks being completed

Bearer services and teleservices on ISDN network
Principles of working for channel switching nodes and packet switching nodes
Advantages and disadvantages of SDH network
Synchronization of bit clocks in transmission networks
Transmission protection in SDH networks and WDM networks
Characteristics of NGN

Practical activites within the subject

Not applicable

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