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 2024	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Obligatory subject group 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

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Narloch
	Teachers	dr inż. Marcin Narloch

Lesson types and methods of instruction	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
	[K6_W35] Knows the concepts of the technique of signal transmission, operation of telecommunications networks and multimedia services and the rules for providing them	Student knows the concepts of the functioning of the telecommunications network and telecommunications services, such as telecommunications service, telecommunications traffic, telecommunications network, connection, routing, signaling, quality of service, principles of service provision, signal transmission techniques, the concepts of multiplexing and synchronization in a transmission network	[SW1] Assessment of factual knowledge
	[K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study	Student describes the architecture of the network, knows the techniques of providing services in the mode of commutation of channels, packets, techniques of signal transmission, multiplexation and synchronization in the transmission network, knows the specificity of individual areas of the telecommunications network and their functional elements	[SW1] Assessment of factual knowledge
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student examines methods for providing services in the mode switching channels, packet signaling techniques, multiplexing and synchronization of the transmission network, identifies their advantages and disadvantages, evaluate the possibility of using	[SU3] Assessment of ability to use knowledge gained from the subject
	[K6_U31] can identify telecommunications network architectures, differentiates their areas and functional elements, evaluates the quality of service delivery, calculates parameters of functional elements	Student identifies the architecture of various telecommunications networks, distinguishes between areas and functional elements, assesses the quality of services, determines the parameters for functional elements of the network	[SU2] Assessment of ability to analyse information

Subject contents	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	Adresy na platformie eNauczanie:

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
Work placement	Not applicable