



## Subject card

Subject name and code	QoS Packet-Optical Networks Design, PG_00064024						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group			Optional subject group Specialty subject group 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			2.0		
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 hab. inż. Sylwester Kaczmarek					
	Teachers	dr hab. inż. Sylwester Kaczmarek					
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	4.0		16.0		50
Subject objectives	getting to know methods of designing next generations networks using different technologies and architecture in individual layers for this one networks						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	The student applies analytical models of service systems and calculates quality parameters, describes advanced service systems for complex packet streams with differentiation of service classes.			[SW1] Assessment of factual knowledge		
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student is using different methods applied in practice of the network design guaranteeing the diversity qualities of services.			[SW1] Assessment of factual knowledge		

Subject contents	<p>Aims and tasks of design the NGN and NGI networks. Parameters describing GoS and QoS packet networks for IP QoS, MPLS, OTN and DWDM technologies. Elements of teletraffic engineering are needed for design. Models of traffic source and streams. Markov streams and description of their irregularities. MMPP stream and its varieties. MMDP model. ON-OFF stream. Self-similarity and its measure; short- and long-range dependent streams. Guaranteed different class of service (streaming, elastic). Service system models for edge (access). Service system models in domens (core). Models with priorities. Models of service systems with self-similar streams. Effective bandwite and calculation methods. Statistical multiplexing REM and RS model. e2e delay budget and its variation in design according to ITU-T. Application of large deviation theory. Traffic control mechanisms and its design. CAC, DBAC and MBAC function. Traffic flow in network and describing source destination path. Z model in network design. Formal description of design. Traffic allocation design. Optimisation of path selection. Dijkstra and Bellman-Ford algorithm. Linear programming methods for solving task design. Integer programming method for solving task design. Evolution algorithms for solving task design. One layer design for IP QoS, MPLS, OTN and DWDM technology. Multilayer design for IP QoS, MPLS, OTN and DWDM technology. Traffic grooming. Designing fault-tolerant networks. Designing networks resistant to changes in the traffic matrix. Designing the interface between the ISDN/GSM network and the IP QoS network.</p>		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	100.0%
Recommended reading	Basic literature	Materials prepared by the lecturer available in electronic form in PDF files and in the form of a photocopy (on request).	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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