



## Subject card

Subject name and code	Engineering of Access and Core Systems, PG_00048154						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2027/2028		
Education level	first-cycle studies		Subject group		Optional 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	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Teleinformation Networks -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Lech Smoleński				
	Teachers		dr inż. Lech Smoleński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		3.0		27.0	75
Subject objectives	Transfer of theoretical and practical knowledge concerning the operation of telecommunications systems in the area of access and core networks, including techniques and equipment, used in the optical transmission WDM, methods protection of transmission, standardization of optical transport network OTN and transmission systems used in access networks for the realization of fixed broadband access, using copper lines, symmetrical or coaxial, fiber optics and radio transmission as well as the functioning of the IP routers with QoS and principles of software switching in a VoIP networks.						
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 describes the principles of operation of optical transport network, knows the standard for transmission systems in access networks, explains transmission security techniques, defines the factors affecting the quality of service QoS		[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		Students evaluate the standard systems used in the area of access and core network with the quality of services, analyzing the use of standardized transmission systems in access network is able to offer the correct configuration of the optical transport network		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	[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 is able to identify telecommunications network architectures, distinguishes their areas and functional elements, assesses the quality of services provided by networks, calculates the parameters of functional elements in the access and core network		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		

Subject contents	<div>1. Specifics of communications networks areas – core, distribution, access</div> <div>2. DWDM optical transmissions systems, elements of optical link</div> <div>3. Amplifying and regeneration of signals on DWDM optical line transmission systems</div> <div>4. Multiplexing equipment (OMUX. OADM) in optical network</div> <div>5. Optical cross-connects (OXC) in optical network</div> <div>6. Transmission protection methods for DWDM optical networks</div> <div>7. Reconfiguration and restoration in DWDM optical networks</div> <div>8. Optical transport network (OTN) – structure and standardization</div> <div>9. Digital wrapper in OTN, optical channels OCh, optical multiplexing OMS, optical transport OTS</div> <div>10. Interfaces and tributary signals in OTN optical layer</div> <div>11. Ethernet in optical transport network (OTN)</div> <div>12. SDH systems in optical networks</div> <div>13. Generic framing procedure (GFP)</div> <div>14. Method of transmission rate adaptation, LCAS protocol</div> <div>15. Functions and structure of broadband access networks</div> <div>16. Optical access on PON – E-PON and G-PON standards</div> <div>17. ADSL broadband access systems – generations of standard</div> <div>18. VDSL broadband access systems –standards</div> <div>19. Ethernet on access network with A/VDSL systems</div> <div>20. Broadband access on HFC networks – standards</div> <div>21. Fixed broadband radio access</div> <div>22. Broadband distribution services in access networks</div> <div>23. QoS in broadband access networks</div> <div>24. Evolution of hardware IP routers architecture</div> <div>25. The structure and operation of the IP QoS router</div> <div>26. Review of IP QoS routers solutions</div> <div>27. Realization of MPLS nodes</div> <div>28. Comparison of applied MPLS nodes</div> <div>29. Architecture of Softswitch</div> <div>30. Review of Softswitch solutions</div> <div>31. Architecture of media and signaling gateways</div> <div>32. Solutions review of media and signaling gateways</div> <div>33. Corporate switching nodes with VoIP</div>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	50.0%	40.0%
	Midterm colloquium	50.0%	60.0%
Recommended reading	Basic literature	Kula S. Systemy i sieci dostępne xDSL, WKŁ, Warszawa, 2009	
		Kula S. Systemy teletransmisyjne, WKŁ, Warszawa 2004	
		Material prepared by the lecturer, accessed in the xeroxcopy form	
	Supplementary literature	Mukherjee B. Optical WDM networks, Springer, New York, 2006	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Configuration of data transport in WDM systems Protection mechanisms for data transport in WDM systems ADSL systems in the access network VDSL systems in the access network Configuration and monitoring passive optical network GEAPON Implementation of multimedia services in the broadband access network		
Work placement	Not applicable		