



Subject card

Subject name and code	Fundamentals of Cellular Systems , PG_00048146						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2024/2025		
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			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Radiocommunication Systems and Networks -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jarosław Sadowski					
	Teachers	dr hab. inż. Jarosław Sadowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15	2.0		33.0	50	
Subject objectives	To get the knowledge of basic aspects of cellular network design and main characteristics of multipath radio channels which have an impact on cellular network functioning.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W34] Knows the characteristics of telecommunications channels, methods of securing information, modulation systems, methods of access to the channel.	Student knows the concept of cellular networks and basic physical phenomena in radio links which have impact on cellular network design.			[SW1] Assessment of factual knowledge		
	[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 can design basic structure of cellular network			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>1 Concept of cellular system, principle of topological design, cell pattern and its motivation, cell cluster</p> <p>2 Analysis of cell cluster size vs. the ratio signal-to-interference, influence of sector antennas on cluster size</p> <p>3 Adjustment of cellular system's topology to the increasing traffic intensity</p> <p>4 Traffic engineering, basic model for the requests of service and serving node, Erlang B formula</p> <p>5 Calculation of the number of channels per cell for a given traffic intensity and grade of service (GoS), calculation of the cell area for a given number of channels and superficial user density, examples</p> <p>6 Multioperator systems and their efficiency, example</p> <p>7 Spectrum efficiency and capacity of cellular systems, example</p> <p>8 Physical properties of a multipath radio channel, Doppler effect</p> <p>9 Baseband equivalent channel impulse response</p> <p>10 Fading and its probabilistic models</p> <p>11 Propagation profiles of radio channel for GSM system, demonstration of varying channel impulse response and its transmittance for urban propagation profile in GSM system</p> <p>12 Influence of terminal speed on fading parameters, universal characteristics for average fade duration and average fading rate vs. level of fade, examples</p> <p>13 Transmit and receive diversity</p> <p>14 Handover in cellular systems</p> <p>15 History of cellular systems and their generations, main targets of cellular systems development</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 1413 794 1447">Subject passing criteria</th> <th data-bbox="799 1413 1141 1447">Passing threshold</th> <th data-bbox="1145 1413 1493 1447">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1447 794 1480">Exam</td> <td data-bbox="799 1447 1141 1480">50.0%</td> <td data-bbox="1145 1447 1493 1480">100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Exam	50.0%	100.0%			
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Recommended reading	<table border="1"> <tbody> <tr> <td data-bbox="453 1491 794 1541">Basic literature</td> <td colspan="2" data-bbox="799 1491 1493 1541">Wesołowski K.: Systemy radiokomunikacji ruchomej, WKŁ, Warszawa, 1998</td> </tr> <tr> <td data-bbox="453 1541 794 1574">Supplementary literature</td> <td colspan="2" data-bbox="799 1541 1493 1574">No requirements</td> </tr> <tr> <td data-bbox="453 1574 794 1615">eResources addresses</td> <td colspan="2" data-bbox="799 1574 1493 1615">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table>			Basic literature	Wesołowski K.: Systemy radiokomunikacji ruchomej, WKŁ, Warszawa, 1998		Supplementary literature	No requirements		eResources addresses	Adresy na platformie eNauczanie:	
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Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											