GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Cellular Systems , PG_00048146		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
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

<table>
<tr><td>Subject contents</td><td>1 Concept of cellular system, principle of topological design, cell pattern and its motivation, cell cluster

2 Analysis of cell cluster size vs. the ratio signal-to-interference, influence of sector antennas on cluster size

3 Adjustment of cellular system’s topology to the increasing traffic intensity

4 Traffic engineering, basic model for the requests of service and serving node, Erlang B formula

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

6 Multioperator systems and their efficiency, example

7 Spectrum efficiency and capacity of cellular systems, example

8 Physical properties of a multipath radio channel, Doppler effect

9 Baseband equivalent channel impulse response

10 Fading and its probabilistic models

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

12 Influence of terminal speed on fading parameters, universal characteristics for average fade duration and average fading rate vs. level of fade, examples

13 Transmit and receive diversity

14 Handover in cellular systems

15 History of cellular systems and their generations, main targets of cellular systems development</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Exam</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Wesołowski K.: Systemy radiokomunikacji ruchomej, WKŁ, Warszawa, 1998</td></tr><tr><td>Supplementary literature</td><td>No requirements</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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