GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| 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<br>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<br><br>2 Analysis of cell cluster size vs. the ratio signal-to-interference, influence of sector antennas on cluster size<br><br>3 Adjustment of cellular system’s topology to the increasing traffic intensity<br><br>4 Traffic engineering, basic model for the requests of service and serving node, Erlang B formula<br><br>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<br><br>6 Multioperator systems and their efficiency, example<br><br>7 Spectrum efficiency and capacity of cellular systems, example<br><br>8 Physical properties of a multipath radio channel, Doppler effect<br><br>9 Baseband equivalent channel impulse response<br><br>10 Fading and its probabilistic models<br><br>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<br><br>12 Influence of terminal speed on fading parameters, universal characteristics for average fade duration and average fading rate vs. level of fade, examples<br><br>13 Transmit and receive diversity<br><br>14 Handover in cellular systems<br><br>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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