



Subject card

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|---|---|--|-------------------------------------|------------|--|---------|-----|
| Subject name and code | Telecommunication Signals, PG_00048115 | | | | | | |
| Field of study | Electronics and Telecommunications | | | | | | |
| Date of commencement of studies | October 2022 | 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 | 3 | Language of instruction | | | Polish | | |
| Semester of study | 5 | ECTS credits | | | 1.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Department of Radiocommunication Systems and Networks -> Faculty of Electronics, Telecommunications and Informatics | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Sławomir Gajewski | | | | | |
| | Teachers | dr inż. Sławomir Gajewski | | | | | |
| 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 | 1.0 | 9.0 | 25 | | |
| Subject objectives | Learning basic properties of modulated signals and methods of telecommunications systems quality evaluation. | | | | | | |
| Learning outcomes | Course outcome | Subject outcome | | | Method of verification | | |
| | [K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications | can analyse noise characteristics | | | [SU2] Assessment of ability to analyse information | | |
| | [K6_W34] Knows the characteristics of telecommunications channels, methods of securing information, modulation systems, methods of access to the channel. | knows basic methods for digital and analog modulation | | | [SW1] Assessment of factual knowledge | | |
| | [K6_W35] Knows the concepts of the technique of signal transmission, operation of telecommunications networks and multimedia services and the rules for providing them | knows modulating systems and their properties | | | [SW1] Assessment of factual knowledge | | |
| | [K6_K02] is ready to critically assess possessed knowledge and acknowledge the importance of knowledge in solving cognitive and practical problems | student critically assesses the properties of systems from the point of view of the type of modulation | | | [SK5] Assessment of ability to solve problems that arise in practice | | |
| | [K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions | can plan noise characteristics for different modulation systems | | | [SU1] Assessment of task fulfilment | | |

| Subject contents | <p>1. Signals transmission in communication systems. Performance of transmission. Noise characteristics of communication system. 2. Fundamentals of multiple access methods. The target of modulation. Modulation with harmonic carrier and pulse carrier. Modulation gain. Temporary amplitude, phase and frequency. 3. Analog amplitude modulation. Characteristics of amplitude modulated signals, spectrum, power, frequency band of signals. Reception of signals. Comparison of different types of amplitude modulation. 4. Analog angle modulation. Characteristics of phase and frequency modulated signals, spectrum, power, frequency band. Reception of signals. Preemphasis and deemphasis. 5. Time domain characteristics of amplitude and angle modulated signals with harmonic and rectangle modulating signals. Characteristics of temporary amplitude, phase and frequency, comparisons. 6. Digital communication system, performance of transmission. Noise characteristics of digital system. 7. Digital baseband modulations. A/D conversion, quantization noise. 8. PCM modulation, companding methods, compressor and expander, noise characteristics. Time domain characteristics of PCM modulated signals. 9. Delta modulation, adaptation, noise characteristics. DPCM modulation, sigma-delta modulation. 10. Reception of binary signals transmitted over AWGN channel. Vector signals representation. Optimisation of reception – matched filter, correlating receiver. 11. Baseband transmission of digital signals. Intersymbol interference (ISI). Channel without ISI – raised cosine filter. 12. Digital modulations with harmonic carrier – ASK, FSK, PSK. Characteristics of modulated signals, spectrum, time-domain characteristics. 13. M-ary digital modulations, quadrature modulation QPSK, methods of modulated signals reception and their performance. 14. Comparison of noise characteristics for digital systems. Vector representation of signals, decision areas. 15. Noise characteristics for digital system with channel coding.</p> | | | | | | | | | | | |
|--|---|-------------------------------|--|--------------------------|--|-------------------------------|--------------------------|-----------------|--------|----------------------|----------------------------------|--|
| Prerequisites and co-requisites | | | | | | | | | | | | |
| Assessment methods and criteria | <table border="1" data-bbox="448 620 1498 689"> <thead> <tr> <th data-bbox="448 620 794 651">Subject passing criteria</th> <th data-bbox="794 620 1141 651">Passing threshold</th> <th data-bbox="1141 620 1498 651">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 651 794 689">Colloquium</td> <td data-bbox="794 651 1141 689">50.0%</td> <td data-bbox="1141 651 1498 689">100.0%</td> </tr> </tbody> </table> | | | Subject passing criteria | Passing threshold | Percentage of the final grade | Colloquium | 50.0% | 100.0% | | | |
| Subject passing criteria | Passing threshold | Percentage of the final grade | | | | | | | | | | |
| Colloquium | 50.0% | 100.0% | | | | | | | | | | |
| Recommended reading | <table border="1" data-bbox="448 696 1498 824"> <tbody> <tr> <td data-bbox="448 696 794 752">Basic literature</td> <td colspan="2" data-bbox="794 696 1498 752">Haykin S.: Systemy telekomunikacyjne, tom 1 i 2. WKiŁ 2004 r. (lub wydania wcześniejsze)</td> </tr> <tr> <td data-bbox="448 752 794 786">Supplementary literature</td> <td colspan="2" data-bbox="794 752 1498 786">No requirements</td> </tr> <tr> <td data-bbox="448 786 794 824">eResources addresses</td> <td colspan="2" data-bbox="794 786 1498 824">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table> | | | Basic literature | Haykin S.: Systemy telekomunikacyjne, tom 1 i 2. WKiŁ 2004 r. (lub wydania wcześniejsze) | | Supplementary literature | No requirements | | eResources addresses | Adresy na platformie eNauczanie: | |
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| eResources addresses | Adresy na platformie eNauczanie: | | | | | | | | | | | |
| Example issues/ example questions/ tasks being completed | | | | | | | | | | | | |
| Work placement | Not applicable | | | | | | | | | | | |

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