



Subject card

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|---|---|--|---|-------------------------------------|---|------------|-----|
| Subject name and code | Antenna Techniques, PG_00048083 | | | | | | |
| Field of study | Electronics and Telecommunications | | | | | | |
| Date of commencement of studies | October 2021 | | Academic year of realisation of subject | | 2023/2024 | | |
| 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 | 6 | | ECTS credits | | 1.0 | | |
| Learning profile | general academic profile | | Assessment form | | assessment | | |
| Conducting unit | Department of Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Rafał Lech | | | | |
| | Teachers | | dr hab. inż. Rafał Lech | | | | |
| 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 | Presentation of antennas analysis tools, properties and parameters of typical antennas, methods of measurement of antenna's parameters | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | [K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions | | tudent has mastered to plan numerical simulations and experiments concerning antenna design and measurements | | [SU3] Assessment of ability to use knowledge gained from the subject | | |
| | [K6_W02] Knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study | | Student has mastered basic theorems concerning antenna theory, knows the structure, properties and parameters of typical antennas as well as measurement methods of fundamental antenna parameters. | | [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects | | |

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| Subject contents | 1. Introduction. Antenna parameters: pattern, directivity, gain. 2. Input impedance of antenna, radiation resistance. 3. Polarization parameters of antennas, noise in antennas. Antenna bandwidth. 4. Basic concepts: physical sources of the radiation field, magnetic current. 5. Equivalence principle, angular spectrum. 6. Near and far fields properties. 7. Uniform linear and planar antenna arrays: Array factor. 8. Antenna arrays with nonuniform amplitude distribution. Fourier and Woodward methods of array synthesis. Smart antennas. 9. Radiating elements: Hertz and magnetic dipoles, half-wave dipole. 10. Feeding structures, baluns. 11. Microstrip and slot antennas. 12. Traveling wave antennas: Yagi-Uda and helical antennas. 13. Frequency independent antennas: biconical, and spiral antenna. Log-periodic antennas. 14. Rectangular and circular apertures. 15. E-plane and H-plane sectoral horns, pyramidal and conical horns. 16. Reflector antennas. Directivity of parabolic reflector. 17. Lens antennas. 18. Antenna measurement: pattern, gain and polarization state measurements. 19. Final test. | | |
| Prerequisites and co-requisites | | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Midterm colloquia | 50.0% | 100.0% |
| Recommended reading | Basic literature | 1. C.A. Balanis: Antenna Theory Analysis and Design, John Wiley and Sons, 1982 2. W. Zieniutycz: Anteny, podstawy polowe, WKŁ, 2000 3. Stutzman W. L. , Thiele G. A.: Antenna Theory and Design, John Wiley New York, 1981 | |
| | Supplementary literature | No requirements | |
| | eResources addresses | Adresy na platformie eNauczanie: Technika antenowa (elektronika) 23/24 - Moodle ID: 36745 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36745 | |
| Example issues/ example questions/ tasks being completed | 1. Define the concept of an equivalent problem due to the external field. 2. Discuss the properties of the electromagnetic field in the far field zone. 3. Discuss the construction of planar version of Marchand balun. 4. Discuss the amplitude and phase distributions in parabolic antenna aperture. | | |
| Work placement | Not applicable | | |