GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Antenna Techniques, PG_00048083		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2024	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	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_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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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 antena design and measurements	[SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>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 Woodword 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.</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>Midterm colloquia</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>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</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>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 apetrure.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
</table>