GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Antenna Technique in Space Applications, E:41035W0 | | |
| Field of study | Space and Satellite Technologies | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | 2024/2025 |
| Education level | second-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 3.0 |
| Learning profile | | Assessment form | assessment |
| Conducting unit | Department Of Microwave And Antenna Engineering -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Włodzimierz Zieniutycz | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 15.0 | 15.0 | 0.0 | 45 |

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 | 45 | 0.0 | 0.0 | 45 |

**Subject objectives**

The aim of the course is to give the students the knowledge of theory, construction and measurement technique of antenna parameters taking into account the specifics the resulting from the applications in space and satellite technologies.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K7_U12 | Student is able to measure the electric parameters of selected antennas and arrays used in space applications, as well as to use numeric tools for simulation of these parameters and for design of classical microstrip antenna. | [SU1] Assessment of task fulfilment |
| [K7_K03] Can analyse and implement assigned tasks while maintaining high technical standards. Is able to work and interact in a group, taking on different roles. Adheres to the principles of professional ethics and respects the diversity of views and cultures. | Student implements his tasks related to parametr analysis and design of antennas maintaining high technical standards. | [SK2] Assessment of progress of work |
| K7_W12 | Student has knowledge on the specificity of the wireless channel used in space applications. | [SW1] Assessment of factual knowledge |

<table>
<tr><td>Subject contents</td><td>1. Introduction: electromagnetic frequency bands, basics of radiation theory and electromagnetic wave guiding, quantitative description of field phenomena.<br><br>2. Antenna parameters: radiation pattern, gain, effective antenna aperture, polarization parameters, noise parameters.<br><br>3. Theory of antenna array, the concept of array factor, , homogeneous and nonhomogeneous linear array, planar array, beam forming systems.<br><br>4. Overview of selected types of antennas: dipoles and their power supply systems, biconical, helical, spiral antennas,tubes, microstrip antennas, slot, reflector antennas.<br><br>5. Earthly space and space as a specific working environmentsfor antennas - factors determining the choice of material and the process of designing and antennas construction.<br><br>6. Antenna measurement: environmental measurements, antenna parameters measurement: radiation pattern, gain, ellipticity, reflection.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic of electromagnetics</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>reports from laboratory</td><td>50.0%</td><td>30.0%</td></tr>
<tr><td>written test from lecture</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>project</td><td>50.0%</td><td>30.0%</td></tr>
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</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, 1982.<br><br>2. W. A. Imbriale, S. Gao, L. Boccia: Space Antenna handbook, J. Wiley, 2012.<br><br>3. W. Zieniutycz: Anteny - podstawy polowe, WKŁ, 2001 (in Polish)</td></tr>
<tr><td>Supplementary literature</td><td>1. G. E. Evans: Antenna Measurement Techniques, Artech House, 1990</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 gain of antenna.<br><br>2. The angular spectrum - discuss the application in antenna measurement.<br><br>3. Discuss the properties of biconical antenna.<br><br>4. Discuss the formula on reflector antenna directivity.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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