GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Antenna Technique, PG_00050023 | | |
| Field of study | Space and Satellite Technologies | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2024/2025 |
| Education level | second-cycle studies | Subject group | Obligatory subject group in the field of study<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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Department of Microwave and Antenna Engineering -> Faculty of Electronics, Telecommunications and Informatics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Włodzimierz Zieniutycz | |
| | Teachers | prof. dr hab. inż. Włodzimierz Zieniutycz | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 30.0 | 0.0 | 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 | 8.0 | 22.0 | 75 |

**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_W07 | Has knowledge on the space specifics and its influence on the design, technology and measurement methods of electric parameters of the antennas and arrays operating in space. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| K7_U08 | He can measure the electric parameters ( e.g. radiation pattern, gain) of selected antennas and arrays used in space application. | [SU1] Assessment of task fulfilment<br>[SU2] Assessment of ability to analyse information<br>[SU4] Assessment of ability to use methods and tools |
| K7_W12 | Has knowledge on the specificity of the wireless channel used in space application | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| K7_U12 | He can simulate numerically electric parameters of selected antennas and arrays used in space application. He can design classical microstrip antenna using the suitable numerical tools. | [SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools |
| K7_U09 | He can assess the suitability of numerical tools to design the selected antennas (e.g. microstrip, reflector antennas) and arrays used in space application. | [SU2] Assessment of ability to analyse information<br>[SU4] Assessment of ability to use methods and tools |

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| Subject contents | 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.<br><br>7. Final test |
| Prerequisites and co-requisites | Basic of electromagnetics |

Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| reports from laboratory | 50.0% | 30.0% |
| written test from lecture | 50.0% | 70.0% |

Recommended reading

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| Basic literature | 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) |
| Supplementary literature | 1. G. E. Evans: Antenna Measurement Techniques, Artech House, 1990 |
| eResources addresses | Adresy na platformie eNauczanie: |

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| Example issues/ example questions/ tasks being completed | 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. |
| Work placement | Not applicable |