



## Subject card

|   |  |   |                                     |            |  |         |     |
|---|--|---|-------------------------------------|------------|--|---------|-----|
| Subject name and code                       | Basics of Electroacoustics, PG_00048142  |   |                                     |            |  |         |     |
| Field of study                              | Electronics and Telecommunications   |   |                                     |            |  |         |     |
| Date of commencement of studies             | October 2020   | Academic year of realisation of subject   |                                     |            | 2023/2024  |         |     |
| Education level                             | first-cycle studies  | Subject group   |                                     |            | Optional subject group<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                               | 4  | Language of instruction   |                                     |            | Polish   |         |     |
| Semester of study                           | 7  | ECTS credits  |                                     |            | 3.0  |         |     |
| Learning profile                            | general academic profile   | Assessment form   |                                     |            | exam   |         |     |
| Conducting unit                             | Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics  |   |                                     |            |  |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor   | prof. dr hab. inż. Roman Salamon  |                                     |            |  |         |     |
|   | Teachers   | prof. dr hab. inż. Roman Salamon<br>dr hab. inż. Iwona Kočańska   |                                     |            |  |         |     |
| Lesson types and methods of instruction     | Lesson type  | Lecture   | Tutorial                            | Laboratory | Project  | Seminar | SUM |
|   | Number of study hours  | 15.0  | 0.0                                 | 15.0       | 0.0  | 0.0     | 30  |
|   | 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  | 30  | 3.0                                 |            | 42.0   |         | 75  |
| Subject objectives                          | The aim of the course is to acquire by students the skills of vibration analysis of simple mechanical systems and knowledge of the working principles and parameters of speakers and microphones.  |   |                                     |            |  |         |     |
| Learning outcomes                           | Course outcome   | Subject outcome   |                                     |            | Method of verification   |         |     |
|   | [K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment | Student describes and analyzes simple mechanical vibrating systems with lumped and distributed elements. He describes sound waves in air and gives their parameters. He classifies sources of acoustic wave and describes their radiation. He clarifies general principle of work of electro-acoustic transducers and performs their classification. He presents working principles and properties of sets of loudspeakers, and working principles and properties of microphones. |                                     |            | [SU3] Assessment of ability to use knowledge gained from the subject                         |         |     |
|   | [K6_W35] Knows the concepts of the technique of signal transmission, operation of telecommunications networks and multimedia services and the rules for providing them   | Student learns the principles of operation and parameters of loudspeakers and microphones as elements of multimedia systems. Student performs measurements of parameters and characteristics of electroacoustic transducers and interprets the results.   |                                     |            | [SW1] Assessment of factual knowledge  |         |     |

| Subject contents   | <ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Elements of discrete mechanical circuits</li> <li>3. Parallel and series connections of mechanical elements.</li> <li>4. Differential equation of resonance mechanical circuit</li> <li>5. Free vibrations of resonance circuits.</li> <li>6. Electromechanical analogies</li> <li>7. Forced vibrations, mechanical impedance</li> <li>8. Differential equations of string and bar vibration</li> <li>9. General solutions of differential equations of string and bar</li> <li>10. Initial and boundary conditions.</li> <li>11. Acoustic wave equation.</li> <li>12. Acoustic pressure, particle velocity, impedance and intensity</li> <li>13. Plane, cylindrical and spherical waves.</li> <li>14. Logarithmic quantities in acoustics.</li> <li>15. Reflection of acoustic plane and spherical waves on the planar boundary.</li> <li>16. Absorption, scattering and refraction of sound.</li> <li>17. Sources of sound, monopoles and dipoles.</li> <li>18. Rayleigh integral.</li> <li>19. Sound radiation of piston membrane, directivity function.</li> <li>20. Directivity function of multiple sources, directivity index.</li> <li>21. Radiation and mutual impedances.</li> </ol> |   |  |                          |                   |                               |                    |       |       |              |       |       |
|--|---|---|--|--------------------------|-------------------|-------------------------------|--------------------|-------|-------|--------------|-------|-------|
| Prerequisites and co-requisites                                |   |   |  |                          |                   |                               |                    |       |       |              |       |       |
| Assessment methods and criteria                                | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Practical exercise</td> <td>60.0%</td> <td>35.0%</td> </tr> <tr> <td>Written exam</td> <td>60.0%</td> <td>65.0%</td> </tr> </tbody> </table>  |   |  | Subject passing criteria | Passing threshold | Percentage of the final grade | Practical exercise | 60.0% | 35.0% | Written exam | 60.0% | 65.0% |
| Subject passing criteria                                       | Passing threshold   | Percentage of the final grade   |  |                          |                   |                               |                    |       |       |              |       |       |
| Practical exercise   | 60.0%   | 35.0%   |  |                          |                   |                               |                    |       |       |              |       |       |
| Written exam   | 60.0%   | 65.0%   |  |                          |                   |                               |                    |       |       |              |       |       |
| Recommended reading  | Basic literature  | A, Dobrucki: Przetworniki elektroakustyczne. WNT Warszawa 2007<br>R. Makarewicz: Dźwięk w środowisku. Ośrodek wydawnictw Naukowych. Poznań 1994   |  |                          |                   |                               |                    |       |       |              |       |       |
|  | Supplementary literature  | No requirements   |  |                          |                   |                               |                    |       |       |              |       |       |
|  | eResources addresses  | Adresy na platformie eNauczenie:<br>Podstawy elektroakustyki 2023 - Moodle ID: 33990<br><a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=33990">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=33990</a> |  |                          |                   |                               |                    |       |       |              |       |       |
| Example issues/<br>example questions/<br>tasks being completed |   |   |  |                          |                   |                               |                    |       |       |              |       |       |
| Work placement   | Not applicable  |   |  |                          |                   |                               |                    |       |       |              |       |       |