



## Subject card

|   |   |  |  |                                     |  |            |     |
|---|---|--|--|-------------------------------------|--|------------|-----|
| Subject name and code                       | Basics of Electronics and Measurement, PG_00047796  |  |  |                                     |  |            |     |
| Field of study                              | Informatics   |  |  |                                     |  |            |     |
| Date of commencement of studies             | October 2021  |  | Academic year of realisation of subject  |                                     | 2021/2022                                      |            |     |
| Education level                             | first-cycle studies   |  | Subject group  |                                     | Obligatory subject group in the field of study |            |     |
| Mode of study                               | Part-time studies   |  | Mode of delivery   |                                     | at the university                              |            |     |
| Year of study                               | 1   |  | Language of instruction  |                                     | Polish   |            |     |
| Semester of study                           | 1   |  | ECTS credits   |                                     | 7.0  |            |     |
| Learning profile                            | general academic profile  |  | Assessment form  |                                     | assessment                                     |            |     |
| Conducting unit                             | Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics   |  |  |                                     |  |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor  |  | dr inż. Sylwia Babicz-Kiewlicz   |                                     |  |            |     |
|   | Teachers  |  | dr inż. Sylwia Babicz-Kiewlicz<br><br>dr hab. inż. Jacek Jakusz<br><br>dr inż. Stanisław Galla |                                     |  |            |     |
| Lesson types and methods of instruction     | Lesson type   | Lecture  | Tutorial   | Laboratory                          | Project  | Seminar    | SUM |
|   | Number of study hours   | 30.0   | 0.0  | 15.0                                | 0.0  | 0.0        | 45  |
|   | E-learning hours included: 0.0  |  |  |                                     |  |            |     |
|   | Adresy na platformie eNauczanie:<br>Podstawy Elektroniki i Miernictwa - Moodle ID: 19453<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19453">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19453</a> |  |  |                                     |  |            |     |
| 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   |  | 10.0                                |  | 120.0      | 175 |
| Subject objectives                          | Acquirement of basic knowledge and skills in the field of electronics and metrology   |  |  |                                     |  |            |     |

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| Learning outcomes  | Course outcome  | Subject outcome  | Method of verification   |
|  | [K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions   |  | [SU1] Assessment of task fulfilment  |
|  | [K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions   |  | [SU2] Assessment of ability to analyse information<br>[SU4] Assessment of ability to use methods and tools |
|  | [K6_W42] Knows and understands, to an advanced extent, architecture, design principles and methods of hardware and software support for local and distributed information systems, including computing systems, databases, computer networks and information applications, as well as the principles of human cooperation with computers and computer-aided teamwork  |  | [SW1] Assessment of factual knowledge  |
|  | [K6_W08] Knows and understands the fundamental dilemmas of modern civilisation and basic economic, legal and other conditions of various types of activities related to the field of study, including the basic concepts and principles in the field of industrial property and copyright protection.   |  | [SW1] Assessment of factual knowledge  |
|  | [K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study  |  | [SW1] Assessment of factual knowledge  |
| Subject contents   | 1. Introduction. 2. Passive components and independent sources in DC, frequency and time domains. 3. Ohm's and Kirchhoff's laws. 4. Norton's theorem. 5. Loop currents" and node voltages" methods. 6. Basic circuits analysis in frequency domain. 7. Electronic signals: types and timings. 8. Bipolar transistor (BJT): properties and Ebers-Moll model. 9. BJT static characteristics 10. DC and AC analysis of BJT based amplifier 11. Unipolar transistor (MOS): properties and Shichman-Hodges model 12. MOS static characteristics 13. DC and AC analysis of MOS based amplifier 14. Basic electronic circuits: operational amplifier, oscillator. 15. Basic logical gates: Invert, Nand, Nor 16. Basic metrological terms: measurement, converter, measuring instrument and system, measurement errors, standard and extended uncertainty. 17. Analog oscilloscope: block diagram, principles of operation. 18. Time base generator, triggering methods. 19. Oscilloscope measurement methods: phase, pulse parameters, observation of device characteristics. 20. Digital method of time interval measurement, +/-1 count error. 21. Digital methods of low and high frequency measurements. 22. Phase measurements. 23. Classification and characterization of digital voltage measurements methods. 24. Dual-slope integration ADC. 25. Voltage to frequency integration ADC. 26. DAC with R-2R ladder. 27. Flash ADC. 28. ADC with subrange 29. Measurements of AC voltage, AC/DC converters of true RMS value. 30. Digital multimeters: 2 & 4-wire resistance to voltage converters. 31. Digital storage oscilloscope, architecture, sampling techniques, modes of operations, applications. 32. Digital measurement methods of impedance parameters R, L, C,  Z . 33. Classification and characterization of measuring systems. 34. Measuring systems based on general purpose interface bus (GPIB), signals and lines, three wire handshake process. 35. Virtual instruments. |  |  |
| Prerequisites and co-requisites                                |   |  |  |
| Assessment methods and criteria                                | Subject passing criteria  | Passing threshold  | Percentage of the final grade  |
|  | Practical exercise  | 50.0%  | 50.0%  |
|  | Colloquiums   | 50.0%  | 50.0%  |
| Recommended reading  | Basic literature  | 1. A. Sedra: Microelectronic circuits, HRW, New York, 2. M. Stabrowski: Cyfrowe przyrządy pomiarowe, PWN, 3. Instrukcje i materiały pomocnicze do laboratorium na <a href="http://www.eti.pg.gda.pl/katedry/kose/dydaktyka/">www.eti.pg.gda.pl/katedry/kose/dydaktyka/</a> , |  |
|  | Supplementary literature  | 1. A. Filipkowski: Układy elektroniczne analogowe i cyfrowe, WNT, 2. J. Dusza, i inni: Podstawy miernictwa, Wyd. Politechniki Warszawskiej,  |  |
|  | eResources addresses  | Podstawy Elektroniki i Miernictwa - Moodle ID: 19453<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19453">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19453</a>  |  |
| Example issues/<br>example questions/<br>tasks being completed |   |  |  |

