GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Basics of Electronics and Metrology, PG_00058908 | | |
| Field of study | Informatics | | |
| Date of commencement of studies | October 2025 | Academic year of realisation of subject | 2025/2026 |
| Education level | first-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 | 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 -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Sylwia Babicz-Kiewlicz | |
| | Teachers | dr inż. Sylwia Babicz-Kiewlicz<br>dr hab. inż. Jacek Jakusz<br>mgr inż. Dariusz Palmowski<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 | | | | | | |

| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
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| | Number of study hours | 45 | 10.0 | 120.0 | 175 |

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| Subject objectives | Acquirement of basic knowledge and skills in the field of electronics and metrology |

Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [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 | Student examines the basic working circuits of the transistor. Measures the frequency characteristics of operational amplifiers. It measures basic electrical quantities: voltage, current, resistance, power and electricity. | [SU1] Assessment of task fulfilment |

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| Subject contents | Electronics:<br><br>1. Passive elements and independent sources in the DC, frequency and time domains<br><br>2. Ohm's and Kirchhoff's laws<br><br>3. Norton's theorem<br><br>4. Method of circuit currents and node voltages<br><br>5. Analysis of elementary circuits in the frequency domain<br><br>6. Electronic signals: types of signals and their time courses<br><br>7. Properties and Ebers-Moll model of bipolar transistor (BJT)<br><br>8. Static characteristics<br><br>9. DC and AC analysis of BJT amplifier<br><br>10. Properties and Shichman-Hodges model of unipolar transistor (MOS)<br><br>11. Static characteristics<br><br>12. DC and AC analysis of MOS amplifier<br><br>13. Elementary electronic circuits; operational amplifier, generator<br><br>14. Basic logical functors: Invert, Nand, Nor<br><br>Metrology:<br><br>1. Basic metrology concepts: measurement, transducer, device, measurement system<br><br>2. Digital oscilloscope: operating principle, triggering methods, applications<br><br>3. Oscilloscope measurement methods: phases, pulse parameters, X/Y characteristics of elements and systems<br><br>4. Digital methods of measuring time intervals, discretization error<br><br>5. Digital methods of measuring low and high frequencies<br><br>6. Digital phase measurements<br><br>7. Characteristics of digital voltage measurement methods<br><br>8. Integration A/C converters with double integration |

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| | 9. Measurements of alternating voltages: measured parameters, AC/DC converters of effective value (True RMS)<br><br>10. Digital multimeters: resistance/voltage converters<br><br>11. Digital methods of measuring impedance parameters R, L, C, \|Z\| |
| Prerequisites and co-requisites | It is obligatory to read the Health and Safety Rules and the Regulations of the Metrology Laboratory. Teachers determine the form of verification. Without familiarizing yourself with the Health and Safety Rules and the Laboratory Regulations, it is not possible to start classes in the metrology laboratory. |

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Sprawozdanie | 50.0% | 25.0% |
| Kolokwium | 50.0% | 25.0% |
| Kolokwium/Prace domowe w formie grywalizacji | 50.0% | 25.0% |
| Test wstępny + Praca na zajęciach + Sprawozdanie | 50.0% | 25.0% |

**Recommended reading**

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| Basic literature | A. Sedra: Microelectronic circuits, HRW, New York<br><br>Materials on eNauczanie<br><br>• Piotrowski J., Podstawy Metrologii, PWN 1977<br>• Piotrowski J., Podstawy miernictwa, WNT 2000<br>• Parchański J., Miernictwo elektryczne i elektroniczne, WSP 1998<br>• Jaworski J., Morawski R., Olędzki J., Wstęp do metrologii i techniki eksperymentu, WNT 1992<br>• Piotrowski J., Podstawy metrologii, Politechnika Śląska 1971<br>• Taylor J. R., Wstęp do analizy błędu pomiarowego, PWN 1999<br>• Tumański S., Technika pomiarowa, WNT 2007<br>• Chwaleba A., Poniński M., Siedlecki A., Metrologia elektryczna, WNT 2009 |
| Supplementary literature | A. Filipkowski: Układy elektroniczne analogowe i cyfrowe, WNT<br><br>• Domańska A., Barzykowski J., Kujawińska M., *Współczesna metrologia wybrane zagadnienia*, WNT 2016<br>• Jakubiec W., Malinowski J., *Metrologia wielkości geometrycznych*, PWN 2018<br>• Bewoor A. K., Kulkarni V. A., *Metrology & Measurements*, Tata McGraw-Hill Education 2009 (dostępna częściowo w books.gogle)<br>• Banerjee G. K., *Electrical And Electronic Measurements*, PHI Learning Pvt. Ltd (dostępna częściowo w books.gogle) |
| eResources addresses | |

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| Example issues/ example questions/ tasks being completed | Discuss the method of digitally converting voltage to a digital value.Present the principle of digital time and frequency measurements.Use of an oscilloscope to observe and measure parameters of periodic and non-periodic signals. |
| Work placement | Not applicable |

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