GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Metrology - laboratory, PG_00047562 | | |
| Field of study | Automatic Control, Cybernetics and Robotics | | |
| Date of commencement of studies | October 2020 | 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 | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish<br>The Laboratory Regulations and Health and Safety Regulations are presented to Students before the start of practical classes. Both regulations must be accepted before starting practical classes. Marks from lab classes, homework, reports and tests cannot be improved. In the event of a justified absence, the method of obtaining a credit is in accordance with the Laboratory's Regulations. |
| Semester of study | 3 | ECTS credits | 2.0 |
| 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>dr inż. Stanisław Galla | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 0.0 | 0.0 | 30.0 | 0.0 | 0.0 | 30 |

E-learning hours included: 0.0

Adresy na platformie eNauczanie:

**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 | 2.0 | 18.0 | 50 |

**Subject objectives**

The aim is to teach: performing measurements of basic electrical quantities: voltage, current, frequency, resistance, capacitance, inductance; operating and making measurements with an analogue and digital oscilloscope; setting up, making measurements, processing of measurement data on computer-controlled measurement systems.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications | Student understands the concept of the measurement system. Can improve the measurement system. It measures basic electrical values: voltage, current, resistance, power and electricity. It measures high and low resistances and impedance parameters of RLC elements. | [SU4] Assessment of ability to use methods and tools<br>[SU2] Assessment of ability to analyse information<br>[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 | Student calibrates analogue and digital electric meters. Measures basic electrical values: voltage, current, resistance, power and electricity. Examines the measuring capabilities of an analog and digital oscilloscope. Measures signal parameters: time, frequency, phase shift. Student measures parameters of selected a / c converters. Measures high and low resistances and impedance parameters of RLC elements. Analyzes the measurement results and evaluates the accuracy of the measurement. | [SU4] Assessment of ability to use methods and tools<br>[SU2] Assessment of ability to analyse information<br>[SU1] Assessment of task fulfilment |

**Subject contents**

1. Introduction: syllabus, characteristic of lab ( one student - one stand, computer monitoring of student"s activity), principles of work and re-ports 2. Familiarization with basic instruments 3. Investigation and calibration of basic measuring instruments of electrical quantities, analog and digital having a PC link 4. Measurements of basic electrical quantities: voltage, current, resistance, power and electrical energy (using electronic P/f converter) 5. Study of analog and digital storage oscilloscope 6. Use of oscilloscopes to measure basic electrical quantities: voltage, pulse parameters, observation of device characteristics, observation of waveforms in digital circuits 7. Investigation of electronic timer-counter features 8. Use of digital methods and oscilloscope for measurements of time, frequency and phase 9. Investigations of properties and modes of operation of measuring sys-tem: bench multimeter, arbitrary function generator, hand-held multimeter 10. Investigation of dual slope integration ADC and voltage to frequency converter in above mentioned system 11. Investigation and calibration of AC/DC transducers: average-responding, peak-responding, AC low and high frequencies 12. Measurement of the RMS value of different types of waveforms with true RMS/DC conversion technique, average-responding instrument and with DSP method 13. Measurements of high and very low resistances with Wheatstone and Thomson bridges as well as using DMM with 4-wire Kelvin connectors 14. Measurements of impedance parameters of RLC components

**Prerequisites and co-requisites**

The Laboratory Regulations and Health and Safety Regulations are presented to Students before the start of practical classes. Both regulations must be accepted before starting practical classes. Marks from lab classes, homework, reports and tests cannot be improved. In the event of a justified absence, the method of obtaining a credit is in accordance with the Laboratory's Regulations.

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Preliminary tests and reports for each exercise | 50.0% | 100.0% |

**Recommended reading**

| | |
|---|---|
| Basic literature | 1. Stabrowski M.: Cyfrowe przyrządy pomiarowe. PWN. 2. Nawrocki W.: Komputerowe systemy pomiarowe, WKiŁ 3. Materiały pomocnicze do wykładu na www.eti.pg.gda.pl/katedry/kmoe/dydaktyka |
| Supplementary literature | 1. Dusza J. i inni: Podstawy miernictwa. Wyd. Politechniki Warszawskiej 2. Guide to the Expression of Uncertainty in Measurement. Wydanie polskie:Wyrażenie niepewnosci pomiaru, Przewodnik, Główny Urząd Miar |
| eResources addresses | |

**Example issues/ example questions/ tasks being completed**

**Work placement**

Not applicable