POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

# COURSE DESCRIPTION CARD - SYLLABUS

Course name
## Metrology

## Course

| Field of study | Year/Semester |
|---|---|
| Electrical Engineering | 1/2 |
| Area of study (specialization) | Profile of study |
| - | general academic |
| Level of study | Course offered in |
| First-cycle studies | Polish |
| Form of study | Requirements |
| part-time | compulsory |

## Number of hours

| Lecture | Laboratory classes | Other (e.g. online) |
|---|---|---|
| 15 | 0 | 0 |
| Tutorials | Projects/seminars | |
| 0 | 0 | |

## Number of credit points

2

## Lecturers

Responsible for the course/lecturer:

Dr inż. Przemysław Otomański
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Faculty of Control, Robotics and Electrical
Engineering
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Responsible for the course/lecturer:

## Prerequisites

Basic knowledge of mathematics, physics, electrotechnics and electronics. Ability to realize efficient self-education in the area related to the chosen field of study. Awareness of the necessity of broadening of the competences in the field of electrical engineering and willingness to work as a team .

## Course objective

Knowledge of measurement methodology, attributes of modern measuring devices and equipment, principles of using analog and digital measuring devices, and evaluation of measurement results.

## Course-related learning outcomes

Knowledge

1. Ability to indicate the basic principles of electrical quantities measurements made with analog and digital devices.

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2. Ability to describe the technical attributes of measuring equipment.

3. Ability to explain a principle of the proper choice of elements of a simple set for measurements of electrical quantities.

Skills

1. Ability to use the basic electrical measuring devices in accordance with operating manuals and to explain appropriate operation of the simple measuring systems.

2. Ability to made a simple measuring task and evaluate the inaccuracy of the obtained results.

Social competences

1. Ability to think and act in the enterprising way in the area of measuring engineering, ability to work as a team.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Continuous estimating with the tests, awarding the skill increase, the evaluation of knowledge and skills connected with the measuring tasks.

## Programme content

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports. Planning and accomplishment of measuring tasks. Electromechanical and electronic measuring devices. Analog and digital measurements of electrical quantities. Measurements of alternating voltage. Testing of a voltmeter equipped with the double-integration A/D converter. Application of analog oscciloscope in measurements. Examples of measurements of electrical quantities. Interpretation of measurement results and estimation of their inaccuracy

## Teaching methods

Lectures: Multimedia presentations expanded by examples shown on a board.

## Bibliography

Basic

1. A. Cysewska-Sobusiak - Podstawy metrologii i inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, Poznań 2010.

2. A. Chwaleba, M. Poniński, A. Siedlecki - Metrologia elektryczna, WNT, Warszawa 2014.

3. J. Rydzewski - Pomiary oscyloskopowe, WNT, Warszawa 2007.

4. A. Cysewska-Sobusiak, Z. Krawiecki, A. Odon, P. Otomański, D. Turzeniecka, G. Wiczyński - Laboratorium z metrologii elektrycznej i elektronicznej, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.

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5. P. Otomański, Z. Krawiecki: Wykorzystanie środowiska LabVIEW do oceny niepewności rozszerzonej wyniku pomiaru rezystancji, Pomiary Automatyka Kontrola nr 12/2011, str. 1561 – 1563, 2011.

6. P. Otomański, M. Lepczyk: Niepewność rozszerzona jako miara niedokładności w pomiarach wybranych wielkości elektrycznych, Poznan University of Technology Academic Journals, Electrical Engineering, vol. 89, pp. 249 – 258, 2017.

7. Hulewicz A., Rozwiązania układowe oraz parametry detektorów wartości szczytowej, Elektronika, nr 7 2014, s. 149-153.

8. Hulewicz A., Krawiecki Z., Narzędzia statystyczne w procesie normalizacji wyników pomiarów, Poznan University of Technology Academic Journals, Electrical Engineering No 88, Computer Applications in Electrical Engineering 2016, Poznan 2016, s. 251-260.

Additional

1. S. Bolkowski - Elektrotechnika, Wydawnictwa Szkolne i Pedagogiczne, Warszawa 2009

2. S. Tumański - Technika pomiarowa, WNT, Warszawa 2007

3. T. Zieliński - Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2007

4. T. Skubis, Podstawy metrologicznej interpretacji wyników pomiarów, Wydawnictwo Politechniki Śląskiej, Gliwice, 2004

5. Międzynarodowy Słownik Podstawowych i Ogólnych Terminów Metrologii, Główny Urząd Miar, Warszawa, 1996

6. www.bipm.org

7. www.gum.gov.pl

## Breakdown of average student's workload

|  | Hours | ECTS |
|---|---|---|
| Total workload | 40 | 2,0 |
| Classes requiring direct contact with the teacher | 17 | 1,0 |
| Student's own work (literature studies, ~~preparation for laboratory classes~~/tutorials, preparation for tests/~~exam, project preparation~~) [1] | 23 | 1,0 |

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[1] delete or add other activities as appropriate