



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Computer measurement systems

### Course

Field of study

Electronics and Telecommunications

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

III/6

Profile of study

general academic

Course offered in

English

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

Prof. dr hab. Waldemar Nawrocki

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Responsible for the course/lecturer:

### Prerequisites

Acquiring knowledge and skills in the field of configuring measuring and monitoring systems as well as their programming using programming languages and programming environments.

### Course objective

To present of the basic definitions and concepts of metrology, measurement methods and



measurement equipment. To introduce students to the analysis and presentation of data and the determination of errors and measurement uncertainty. Practical carrying out laboratory experiments involving the preparation and execution of measurements.

### Course-related learning outcomes

#### Knowledge

1. Student has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment.
2. He/she has knowledge of devices and systems exploitation.

#### Skills

1. Student is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.
2. He/she is able to prepare a well-documented study, in English or in Polish, on problems related to electronics and telecommunication.
3. He/she is capable of studying autonomously.
4. He/she is able to measure typical parameters of signals, systems and devices, in particular voltage, electrical resistance, temperature, pressure and others used in measuring systems. Student is able to choose appropriate methods to measure given electrical quantities and parameters of signals and devices. He/she is able to plan and perform measurements and analyze the results.

#### Social competences

1. Demonstrates responsibility and professionalism in solving technical problems.
2. Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.
3. Is aware of the main challenges facing electronics and telecommunication in the 21st century.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Evaluation of student preparation for experiments, acceptance of students reports

### Programme content

- Structure of measurement systems.

Accuracy and dynamics of measurements. The New SI S2018 System of Units.

- Functions of interfaces in measurement systems
- Serial interfaces: RS-232 and others (RS-530, RS-485).



- Interfaces for smart sensors.
- Parallel interfaces: IEEE-488, IEC-625, GPIB, HPIB. Measurement systems using IEEE-488
- Other parallel interfaces: VXI i PXI
- Measurement systems using LAN
- Measurement systems using GSM/LTE for data transmission.
- Wireless data transmission for short distance in measurement systems: Bluetooth, ZigBee.
- Data acquisition boards. Virtual instruments.
- Conditioners
- Sensors and circuits for temperature, strain and pressure

### Teaching methods

lectures, laboratory experiments, consultations, individual study

### Bibliography

#### Basic

1. Computer-Based Measurement Systems, Nawrocki W., skrypt w formie maszynopisu wydany przez PP w ramach programu "Inżynier przyszłości" i finansowany przez Unie Europejska, Poznań, 2017.
2. Measurement Systems and Sensors, Nawrocki W., Artech House, London-Boston, wyd. 2, 2015.
3. Practical Data Acquisition for Instrumentation and Control Systems, Park J., Mackey S. Elsevier, 2003.
4. Komputerowe systemy pomiarowe. Ćwiczenia laboratoryjne, Praca zbiorowa, Wyd. PP, Poznań, 2007.

#### Additional

1. Introduction to Quantum Metrology, Nawrocki W., Springer, Heidelberg, wyd. 2, 2019.
2. Komputerowe systemy pomiarowe, Nawrocki W., Wyd. Komunikacji i Łączności, Warszawa, 2006.
3. Sensory i systemy pomiarowe, Nawrocki W., Wyd. PP, Poznań, 2006.



### Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	35	1,0

<sup>1</sup> delete or add other activities as appropriate