



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Advanced sensory systems

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Intelligent Measurement Systems

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

Dr inż. Michał Bołtrukiewicz

email: Michal.Boltrukiewicz@put.poznan.pl

tel. 61 665 2599, 61 665 2632

Faculty of Division of Control, Robotics and

Electrical Engineering

ul. Piotrowo 3A, 60-965 Poznan

Responsible for the course/lecturer:

### Prerequisites

The student should have knowledge of electrical metrology, electronics and microprocessor technology. He should know the basics of the C++ language and connect simple measuring systems based on diagrams. He should work effectively in a group.

### Course objective

Understanding the principles of operation, configuration and programming of intelligent sensors and AFE systems

### Course-related learning outcomes

Knowledge



1. Has extended knowledge in the field of measurements of electrical quantities and selected non-electrical quantities. Has knowledge of the development of the results of the experiment
2. Has extended knowledge in the field of analysis and synthesis of intelligent measurement sensors and AFE systems.

#### Skills

1. Can obtain information from literature, catalog cards of electronic components and other sources, interpret them, evaluate them, critically analyze and synthesize them, and use them in work with selected programming languages and development tools.
2. Reads and understands professional literature in Polish and English. Can check and deliver a presentation on the implementation of project or research tasks.

#### Social competences

1. Is aware of the need to develop professional achievements and observe the rules of professional ethics, fulfill social obligations, inspire and organize activities for the social environment.

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written test (passing threshold: above 50%) or control thesis in the form of a project

Laboratory classes: Initial assessment of knowledge needed to solve laboratory tasks. Continuous assessment in all laboratory classes and rewarding activity and skills improvement. Assessment of the final reports from laboratory classes.

#### Programme content

Lecture: The basic of principle of operating of measurement sensors. The conditioning of signal from sensor. Integrated conditioners of measuring signals with analog output. Wired and wireless standards of data transmission using in sensory systems. Using of intelligent sensors with digital interface. The principles of operation and programming AFE (Analog Front to End) systems. Application of microcontrollers in sensory systems.

Laboratory classes: Issues of communication and programming of intelligent measuring sensors and AFE systems.

#### Teaching methods

Lecture: Multimedia presentations with examples shown on the board and demonstration experiments. Indicating the practical aspect of the issues discussed. Solving issues of a design nature. Assessment of student activity during classes.

Laboratory classes: Team work. Practical implementation of experiments supported by multimedia presentations. Discussion of reports by the teacher.

#### Bibliography



Basic

1. Mielczarek W., Szeregowe interfejsy cyfrowe, Wyd. Helion, Gliwice 1993.
2. Nawrocki W., Sensory i systemy pomiarowe, Wyd. Politechnik Poznańskiej, Poznań 2006????.
3. Bogusz J., Lokalne interfejsy cyfrowe w systemach cyfrowych. Wyd. BTC, Warszawa 2004
4. Baranowski R., Mikrokontrolery AVR ATmega w praktyce. Wyd. BTC, Warszawa 2005
5. M. Miłek, Metrologia elektryczna wielkości nieelektrycznych, Wyd. UZ, Zielona góra, 2006.
6. A. Gajek, Z. Juda, Czujniki samochodowe, WKŁ, Warszawa 2011.
7. Kniat J. Programowanie obiektowe w języku C++. Wydawnictwo Politechniki Poznańskiej, Poznań 1995.
8. Sibigroth J.M. Zrozumieć małe mikrokontrolery, Wydawnictwo BTC, Warszawa 2003.
9. Pełka R. Mikrokontrolery architektura, programowanie, zastosowania. WKiŁ, Warszawa 1999.

Additional

1. Zieliński T., Cyfrowe przetwarzanie sygnałów. WKiŁ, Warszawa 2005.
2. P. Horowitz, W. Hill Sztuka elektroniki. Cz. 1 i 2, WKiŁ. Warszawa, 2013.
3. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa, 2009.
4. Hajduk Z., Mikrokontrolery w systemach zdalnego sterowania. Wydawnictwo BTC. Warszawa 2005.
5. Hulewicz A., Cysewska-Sobusiak A., Bołtrukiewicz M., Wireless transmission of photoplethysmographic signals, Elektronika, nr 8-9/2004, s.142-145.
6. Hulewicz A., Bołtrukiewicz M., Prokop D., Cysewska-Sobusiak A., Mikroprocesorowe urządzenie do numeracji pakietów UDP, Pomiary Automatyka Kontrola, nr 9/2005, s. 34-36.
7. Bołtrukiewicz M., Generator cyfrowy do współpracy z czujnikami pomiarowymi, Elektronika, nr 6/2008, str. 180-181.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for final test) <sup>1</sup>	25	1,0

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