STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Virtual measuring devices**		Code **1010324391010325953**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **5 / 9**
Elective path/specialty **Measurement Systems in Industry and**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **9** Classes: **-** Laboratory: **-** Project/seminars: **18**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **3 100%** **3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge in the scope of electrotechnics, electronics, computer science, and metrology
2	**Skills**	Ability of the efficient self-education in the area of the chosen field and speciality of study
3	**Social competencies**	Awareness of the competencies broadening and ability to show the readiness to cooperate as a team

Assumptions and objectives of the course:

- Knowledge of the modern techniques of acqusition, processing and presentation of measuring data.
- Selected examples of the realization of virtual measuring devices.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Ability to characterize the importance and and application possibilities of the modern measuring systems - [K_W05 ++, K_W18 +]
2. Ability to explain the principles and techiques of measuring signal acquisition for industrial applications - [K_W07 +]

Skills:

1. Ability to work independently and as a team in the design and construction companies, research laboratories, industrial centres, and medical facilities - [K_U05 +]
2. Ability to design the measuring systems creatively, using possibilities offered by new technologies - [K_U22 +]

Social competencies:

1. Ability to think and act enterprisingly in the area of the measuring systems to be used in industry - [K_K01 +, K_K04 +]

Assessment methods of study outcomes

Lectures:

- evaluation of the knowledge with tests related to the content of lectures (test, computational and problem questions), awarding marks in laboratory exercises)
- continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception).

Projects:

- continuous estimating with the tests,
- awarding the skill increase,
- evaluation of the knowledge and skills concerning the realization of an individual project, evaluation of the made project.

Course description

Updating 2017:

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.

Lectures:

Multimedia presentations expanded by examples shown on a board. Activity of students is taken into consideration in final students evaluation. Theoretical questions are presented in the exact reference to the practice.

Projects:

Groups of students work as teams. Discussion on different methods and aspects of problem solutions. Detailed reviewing of particular projects documentation with:

- General characteristics of the selected environments to program and control the measuring equipment.
- Metrological properties of the DAQ cards.
- Functional structure of a virtual measuring device.
- Realization of a device with the multi-functional DAQ card.
- Principles of preparation of an user interface and program code by the use of LabVIEW environment.
- The program realization of some selected functions of measuring devices.

Basic bibliography:

1. D. Świsulski, Komputerowa technika pomiarowa, oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW, Agenda Wydawnicza PAK, Warszawa 2005.
2. M. Chruściel, LabVIEW w praktyce, Wydawnictwo BTC, Warszawa 2008.

Additional bibliography:

1. R. Rak, Wirtualny przyrząd pomiarowy. Realne narzędzie współczesnej metrologii, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2003.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	9
2. Participation in projects classes	18
3. Participation in consulting with the lecturer	3
4. Realization of projects	26
5. Preparation to the credit	26

Student's workload

Source of workload	hours	ECTS
Total workload	82	3
Contact hours	30	1
Practical activities	70	3