STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Virtual measuring devices		**1010321371010325953**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**4 / 7**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Measurement Systems in Industry and	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **15**	Classes: **-**	Laboratory: **-**	Project/seminars: **30**	**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**5 100%**
Technical sciences	**5 100%**

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.

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	15
2. Participation in projects classes	30
3. Participation in consulting with the lecturer	25
4. Realization of projects	40
5. Preparation to the credit	23

Student’s workload

Source of workload	hours	ECTS
Total workload	133	5
Contact hours	70	3
Practical activities	70	3