Course code B.5.2. **Course item** ……

1. INFORMATION ABOUT THE COURSE

A. Basic information

Course title	Computer Measurments
Field of study	Computer Aided Engineering
Cycle	*Second*
Study profile	*Academic*
Study mode	*Full-time*
Specialisation	*Not relevant*
Unit responsible for the field of study	*Faculty of Mechanical Engineering*
Lecturer	*Dr Adam Dittmar-Wituski*
Introductory courses	*Not relevant*
Prerequisites	*Knowledge of basic programming, electronics*

B. Semester/ weekly timetable

Semester	Lectures	Classes	Laboratories	Project classes	Seminars	Field experience	ECTS credits
I	15	-	15	-	-	-	4

LEARNING OUTCOMES (acc. to National Qualifications Framework)

No.	Description of learning outcomes	Reference to learning outcomes for the field of study	Reference to learning outcomes for the area of study
KNOWLEDGE			
K1	After finishing of the course the student has the detailed knowledge needed to use the computers in the measurements and technical measurements programming.	CAE_W01	T2A_W02
K2	After completing the course the student has knowledge of measuring systems, data processing technology, design, and Matlab/LabView measurement programming environment.	CAE_W05	T2A_W04, T2A_W06
K3	After completing the course the student has knowledge of directions of programming environments development and data exchange between different computer-aided environments; knows ways of solving these problems.	CAE_W07	T2A_W04, T2A_W05
SKILLS			
S1	The Student can schedule an experiment and design a program for data acquisition and processing using computer-aided tools; the Student can propose improvements to existing structures and systems	CAE_U02	T2A_U09, T2A_U16, T2A_U17

S2	The Student knows how to configure and use automatic measuring system, basic standards of computer measuring systems and can evaluate the usefulness of computer-aided tools for measurements.	CAE_U05	T2A_U15, T2A_U18
S3	After the end of the course the student is able to prepare a scientific study on the results in foreign language and interpret the results and draw conclusions from them.	CAE_U07 CAE_U08	T2A_U01, T2A_U03, T2A_U10
S4	The Student can obtain knowledge and information regarding the tasks of the project, using the Internet and publishing of literature.	CAE_U07	T2A_U01
S5	The Student can plan and carry out experiments and computer simulations, interpret the results and draw conclusions.	CAE_U12	T2A_U08
S6	The Student can evaluate the usefulness and the possibility of the use of new developments in the field of computer-measurement systems I engineering work	CAE_U15	T2A_U12
SOCIAL COMPETENCES			
SC1	The Student understands the need to raise their qualifications, understands the need to constantly adapt their knowledge and skills to the changes taking place in the measurement technology.	CAE_K01	T2A_K01
SC2	The Student can pull together and work in a group, taking different roles.	CAE_K03	T2A_K03
SC3	He can think and act creatively.	CAE_K06	T2A_K06

2. TEACHING METHODS

Multimedia lecture, laboratory, design exercises.

2. METHODS OF EXAMINATION

Written exam with a lecture, preparation of the project - a computer program for data acquisition in LanView. Submission of a report containing a discussion and interpretation of the results of measurements carried out in the laboratory.

3. COURSE CONTENT

Specify the content separately for each type of classes in accordance with point I.B.	LECTURES 1. The structure of the measuring system controlled by computer and configuration. 2. System interface GPIB - IEEE 488 and Instrument Programming. 3. Data Acquisition Card (DAQCard) Structure and applications. 4. Distributed measuring systems. 5. Programming of measurement systems in Matlab/LabView. LABORATORIES A Matlab/LabView project to develop a system of measurement and control with stand -alone instruments, DAQCard system and/or distributed measurement system (CompactRio, LabView). In the framework of the laboratory project the students carry out measurements of analog signals coming from the sensors, by using the instruments (voltmeter, generator, multiplexer) and universal DAQ Card and computer system. Students design a control program (Matlab/LabView) with the visualization of measurement data in real time (software interface), shall carry out an initial reduction of the results and their interpretation. Classes project (examples): 1. Measurements of different electrical parameters by digital board DAQ and stand-alone instruments – virtual oscilloscope. 2. Generation and measurement of electrical signals by D/A boards. 3. Temperature measurement and control in Matlab and LabView environments. 4. Oscillations in the RLC circuit – measurements of frequency and relaxation time..

4. VALIDATION OF LEARNING OUTCOMES

(Each learning outcome from the list requires validation methods to ensure that it was achieved by a student.)

Learning outcome	Form of assessment (for example:)					
	Oral examination	Written examination	Colloquium	Project	Report	……
K1		x		x	x	
K2		x		x	x	
K3		x		x	x	
S1				x		
S2				x		
S3				x		
S4				x		
S5				x		
S6				x		
SC1		x			x	
SC2					x	
SC3					x	

5. LITERATURE

Basic literature	1. Matlab Users Guide, Mathworks Inc. 2. LabVIEW for data acquisition, Bruce Mihura, Prentice Hall PTR 2001,

	ISBN 0-13-015362-1. 3. LabVIEW for Everyone: Graphical Programming Made Easy and Fun, Jeffrey Travis, Jim Kring Prentice Hall PTR 2006,ISBN-10:0131856723. 4. Waldemar Nawrocki, Measurement Systems and Sensors, ARTECH HOUSE, INC, 2005, ISBN 1-58053-945-9. 5. S Tumanski, Principles Of Electrical Measurement, CRC Press, Taylor & Francis Group, 2006, ISBN-13: 978-0-7503-1038-3.
Supplementary literature	1. Signal Conditioning & PC-Based Data Acquisition Handbook, 3rd ed., Measurement Computing Corporation, 2012 2. Data Acquisition. Catalog & Reference Guide. Keithley. 3. INSTRUMENTATION, Reference and Catalogue. National Instruments. 6. Jacob Fraden, Handbook of Modern Sensors, Physics, Designs, and Applications, Fourth Edition, Springer New York Heidelberg Dordrecht London 2010, ISBN 978-1-4419-6465-6.

6. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity	Student workload– number of hours (for example:)
Participation in classes indicated in point 2.2	30
Preparation for classes	20
Reading assignments	25
Other (preparation for exams, tests, carrying out a project etc)	25
Total student workload	100
Number of ECTS credits allocated by the lecturer	**4**
Final number of **ECTS credits (determined by the Programme Council for the Field of Study)**	4