

COURSE DESCRIPTION

1. Course title: COMPUTER MEASUREMENT SYSTEMS		2. Course code: CMS		
3. Validity of course description: 2019/2020				
4. Level of studies: 2 nd cycle of higher education				
5. Mode of studies: intramural studies				
6. Field of study: Informatics				
7. Profile of studies: general academic				
8. Specialty: Industrial Informatics Systems				
9. Semester: I				
10. Faculty teaching the course: Institute of Informatics				
11. Course instructor: PhD Wojciech Mielczarek				
12. Course classification:				
13. Course status: obligatory				
14. Language of instruction: English				
15. Pre-requisite qualifications: circuit theory, operating systems, embedded systems, programming in C				
16. Course objectives:				
The course gives students familiarity with the following topics:				
- analog and digital Data Acquisition Systems (DAS),				
- interfacing DAS to a microcontroller and PC computer,				
- computer controlled measurement systems basing on DAS cards and measurement instruments attached by standard interfaces like RS-232, RS-422, RS-485, USB, IEEE-488.2 (GPIB),				
- Standard Commands for Programmable Instruments (SCPI language),				
- data acquisition and control programming in Agilent VEE and LabView,				
- good practices of communication with peripheral equipment (including protection against noise).				
17. Description of learning outcomes:				
Nb.	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Understanding fundamentals of analog measurement data acquisition in a computer system.	Final test	Lecture	K2A_W02; K2A_W14
2.	Knowledge on: conditioning, scaling, multiplexing, sampling and converting (A/D) analog measurement signals, converting D/A, DAS systems configurations.	Final test	Lecture	K2A_W02; K2A_W11
3.	Knowledge on: RS-232, RS-422 ports, RS-485, USB, IEEE-488 buses and controlling of SCPI compatible devices.	Final test	Lecture	K2A_W11; K2A_W14
4.	Skills, how to choose, install and configure (setting parameters) analog data acquisition system.	Laboratory exercise	Laboratory, project	K2A_U10; K2A_U12; K2A_U13
5.	Skills, how to configure data acquisition system based on SCPI compatible instruments, attached to a controller by standard serial ports (RS-232, RS-485, USB), LAN port or GPIB bus.	Laboratory exercise	Laboratory	K2A_U07; K2A_U10; K2A_U12; K2A_U13
6.	Skills for controlling SCPI compatible peripheral devices; building an application oriented on data acquisition and control in Agilent VEE or LabView environments.	Laboratory exercise	Laboratory	K2A_U07; K2A_U10; K2A_U13
18. Teaching modes and hours				
Lecture: 15 h				
Laboratory: 30 h				

19. Syllabus description:**Lectures:**

1. Data acquisition systems – inputting/outputting analog and digital signals to and from a microprocessor.
2. DAS cards for a PC computer
3. Measurement and control systems based on RS-232, RS-422A and RS-485 interfaces
4. USB based measurement systems
5. IEEE-488.2 (GPIB) interface
6. Controlling the instruments in SCPI language.
7. Visual programming environments Agilent VEE and LabView
8. Protection of data transmission circuits against noises.

Labs:

1. Interfacing DAS to a microcontroller.
2. Controlling the measurement system based on asynchronous, serial transmission and multipoint RS-232 switches.
3. The fieldbus based on RS-485 and MODBUS protocol.
4. IEEE-488 (GPIB) interface.
5. Controlling the SCPI instruments.
6. Programming in Agilent VEE.
7. Programming in LabView
8. Data transmission circuits protection against noises – physical aspects

20. Examination: none**21. Primary sources:**

1. Engineering Staff of Analog Devices: *Analog - Digital conversion handbook*, Analog Devices Inc., Norwood, Massachusetts 02062 USA
2. Anderson D.: *Universal Bus System Architecture*, Addison-Wesley Developers Press, 1997 by MindShare, Inc.

22. Secondary sources:

- W. Mielczarek: *Szeregowe interfejsy cyfrowe*, Helion 1993
 W. Mielczarek: *USB – Uniwersalny interfejs szeregowy*, Helion 2006
 W. Mielczarek: *Tłumienie zakłóceń i ochrona informacji w systemach pomiarowych*, Wydawnictwo Politechniki Śląskiej, skrypt nr 1921, Gliwice 1995
 W. Mielczarek: *Urządzenia pomiarowe i systemy kompatybilne ze standardem SCPI*, Helion 1999
 W. Mielczarek: *Komputerowe systemy pomiarowe, Standardy IEEE-488.2 i SCPI*, Wydawnictwo Politechniki Śląskiej, Gliwice 2002
 D.Caban, W.Mielczarek, R.Pawłowski: *Komputerowe systemy pomiarowe, ćwiczenia laboratoryjne*, Wydawnictwo Politechniki Śląskiej, Gliwice 2004

It is possible to download 5 presentations as pdf files:

- Analog Data Acquisition Systems*
- RS-232 – serial communication port*
- IEEE-488 and SCPI standards*
- USB – Universal Serial Bus*
- Noise reduction in distributed computer systems*

23. Total workload required to achieve learning outcomes

Nb	Teaching mode :	Contact hours / Student workload hours
1	Lecture	15/15
2	Classes	30/15
3	Laboratory	/
4	Project	/
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	45/30

24. Total hours: 75**25. Number of ECTS credits: 2**

26. Number of ECTS credits allocated for contact hours: 1
27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1
28. Comments:

Approved:

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(date, Instructor's signature)

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(date, the Director of the Faculty Unit signature)