

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Control systems of gas and energy processes		Code 1010632231010535538
Field of study Mechanika i budowa maszyn	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 3
Elective path/specialty Gas technology and renewable energy	Subject offered in: English	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 2
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 %) 2 100% 2 100%
Responsible for subject / lecturer: dr hab. inż. Paweł Śniatała email: pawel.sniatala@put.poznan.pl tel. tel. 61 665 2184 Wydział Informatyki ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Technical disciplines such like physics and mathematis. The basics of the theory of signal processing and electronic systems. The knowledge of basic concepts from the range of computer science. Safety precautions for working in laboratory with computer sets and electronic devices.
2	Skills	Practice in using typical CAD tools. Student should have skills required to solve engineering problems with scientifically valid methodologies. help of scientific methods. Can effectively acquire the information from various sources including datasheets, literature and Internet.
3	Social competencies	Student knows restrictions of the own knowledge and the skill; has the consciousness of the importance and understands extratechnical aspects and results of the activity of the engineer.
Assumptions and objectives of the course: The course will present the basic measuring parameters used in gas industry. The measurements techniques their implementations will be presented. Student will practice in a real measurements and data processing devices used in gas industry and will have the knowledge how to configure them.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has an in-depth knowledge about the measurements techniques of physical quantities used in gas systems. ? [K2A_W18] - [-]		
2. Has an extended knowledge in selected areas of technical mechanics related to the chosen specialization ? [K2A_W08] - [-]		
3. HHas a general understanding of the types of tests and test methods for working machines using modern measurement techniques and data acquisition ? [K2A_W20] - [-]		
Skills:		
1. Student is able to program a data transmission chain with the use of Internet. - [K1A_U10] - [-]		
2. Is able to freely use an international language in contacts with professionals from the same field of study.- [K2A_U01] - [-]		
3. Is able to perform a basic configuration of SCADA system to monitor and control a typical process [K2A_U08] - [-]		
Social competencies:		
1. Understands the need for lifelong learning; is able to inspire and organize the learning process of others. ? [K2A_K01] - [-]		
2. Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions. - [K2A_K02] - [-]		

Assessment methods of study outcomes		
Lecture ? the written examination		
Classes - final test and rewarding knowledge necessary for the accomplishment of the problems in the area of the subject		
Course description		
Structure of measuring systems used in gas industry, Basic terms related with telemetry, SCADA and system components, Basic quantities and laws according to gas theory, Pressure, temperature, flow, Measuring methods and sensors, Principles of operation and typical applications for temperature and pressure sensors. Gas flow meters: types of internal structures. Gas flow correction units. Chromatographs, Data transmission systems, Interface and communication protocols used in gas systems, SCADA Systems, Typical functionalities of SCADA systems, overview of existing solutions in that field, MEMS devices for gas industry, Sensors and actuators for control systems using Micro Electro-Mechanical Systems		
Basic bibliography:		
1. Osiadacz A.J., Chaczykowski M.: Stacje gazowe. Teoria, projektowanie, eksploatacja.		
2. Grabowski H.: Poradnik techniczno-budowlany dla użytkowników sieci gazowej w systemie dystrybucyjnym. SITPNiG Ośrodek Szkolenia i Rzecoznawstwa, Grupa Terenowa Rzecoznawców w Poznaniu, 2011.		
3. ZN-G-4001- 4007: 2001. Pomiary paliw gazowych.		
Additional bibliography:		
1. Rybicki Cz., Łuczyński S.: Pomiary natężenia przepływu. Wiertnictwo Nafta Gaz, t. 24 z.2, 2007.		
2. Barculo, D., Daniels, J.: Telemetry: Research, Technology and Applications, Nova Science Publishers, Incorporated, 2009.		
3. Korbicz J.: Measurements models systems and design, WKiŁ 2007.		
Result of average student's workload		
Activity	Time (working hours)	
1. Preparation for the lecture	5	
2. Participation in the lecture	15	
3. Fixing the lecture	15	
4. Consultation for the lecture	2	
5. Preparing to pass the lectur	10	
6. Participation in the completion of the lectur	2	
7. Preparation for the laboratory classes	10	
8. Participation in the laboratory	15	
9. Consultation for the laboratory classes	3	
10. Preparing to pass laboratory	5	
11. Participation in the completion of the laboratory	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	84	2
Contact hours	39	0
Practical activities	0	0