

DESCRIPTION OF THE COURSES

- Course code: **ARR3304**
- Course title: **INDUSTRIAL MEASURING**
- Language of the lecturer: polish

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	2		2		
<i>Number of hours/semester*</i>	30		30		
<i>Form of the course completion</i>	<i>test</i>		<i>completion</i>		
ECTS credits	3		2		
Total Student's Workload	90		60		

- Level of the course (basic/advanced): advanced
- Prerequisites: Introduction into metrology
- Name, first name and degree of the lecturer/supervisor: Wojciech Grotowski Ph.D.
- Names, first names and degrees of the team's members: Jerzy Leszczyński Ph.D.
- Year: 2..... Semester: 4.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): Knowledge of non-electrical quantity measurement methods and systems, working knowledge of application of standard transducers and measurement devices.
- Form of the teaching (traditional/e-learning): traditional
- Course description: Organization of industrial control-measuring systems, structures of systems, algorithms of operation. Industrial electric quantity measuring systems, measuring converters of electrical quantities. Monitoring of electrical net parameters, measurement of voltages, power, energy, distortions. Measurement of non-electrical quantities, measuring sensors and converters of non-electrical quantities – measurement of mechanical quantities, temperature, chemical composition, substance properties. Sensors and converters in measuring systems, intelligent measuring converters. Measuring machines and robots – the essence of coordinate measuring technique.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Structures of measuring – control systems. Basic notions, algorithms of operation	2
2. Input systems of control – measuring systems	2
3. Industrial converters of electrical quantities: voltages and streams, power, frequency, phase displacement and energy	6
4. Systems monitoring electroenergetic net parameters – definitions, standards, methods of defining	4
5. Transformation of non-electrical quantities: measuring sensors, static and dynamic properties	2
6. Measurement of mechanical quantities	4
7. Measurement of temperature	4
8. Measurement of chemical composition	2
9. Measurement of substance properties	2
10. The essence of coordinate measuring technique – measuring machines and robots	2
11. Mathematical description of typical measuring procedures	3
12. Measuring heads and systems, examples of coordinate measuring machines	3
13. Exactness of measuring machines and robots, methods of their attestation	3
14. Organisation and managing measuring industrial system activity.	2
Transmission of information, metrological properties.	
15. Test	

1. Classes – the contents:

2. Seminars – the contents:
3. Laboratory – the contents:
 - Measurement of force and mechanical torque – methods of conversion of physical quantities into electric signal
 - Methods of industrial temperature measuring, characteristics of conversion, metrological properties
 - Pressure and flow measurement based on study of delivery of a pump
 - Instrumental methods of water quality determination (conduction, pH). Physical and chemical interpretation of results
 - Determination of thermal comfort parameters
 - Study of measuring converters of electrical quantities distorted signals
 - Measurement of parameters describing quality of energy
4. Project – the contents:
5. Basic literature:
 1. Romer E., Miernictwo przemysłowe, PWN W-wa 1978
 2. Michalski L., Pomiary temperatury, WNT W-wa 1986
 3. Ratajczyk E., Współrzędnościowa technika pomiarowa – maszyny i roboty pomiarowe, OWPW W-wa 1994
6. Additional literature:
 1. Pomiary cieplne (część I i II) – praca zbiorowa WNT W-wa 1995
 2. O'Donoghue V., Synchro & Resolver Conversion, Analog Devices 1980
 3. Norton K., Sensor and ...
4. Conditions of the course acceptance/creditation:

* - depending on a system of studies