

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**SUPERVISOR DECLARING/CONDUCTING COURSE: PhD. DSc. Artur ILUK, Assoc. Prof.**

**DEPARTMENT: Faculty of Mechanical Engineering**

**SCIENTIFIC DISCIPLINE: Mechanical Engineering**

**COURSE CARD**

**Course name in Polish:** Nowoczesne techniki pomiarowe

**Course name in English:** Advanced measurement techniques

**Course language:** English

**University-wide general course type\*:**

**The course is intended for all PhD students: YES / NO**

**1) BASIC COURSE**

**2) SPECIALIST COURSE**

**3) SEMINAR**

**4) HUMANISTIC COURSE**

**5) LANGUAGE**

**Subject code: MEQ100184W**

\* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)				30
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Basic knowledge of measurement techniques
2. Basic knowledge of metrology
3. Basic knowledge of the laws of physics and technical mechanics

**COURSE OBJECTIVES**

Expanding knowledge in the field of modern measurement techniques  
Getting to know the practical applications of measurements using modern measuring techniques.  
Presentation of limitations and barriers in the use of modern measurement techniques.

**PROGRAM CONTENTS**

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

<b>Form of classes</b>		Number of hours
Mf1	Introduction - introduction to modern measurement methods	2
Mf2	Photogrammetric measurements - TRITOP system	2
Mf3	Thermal imaging measurements - FLIR ThermoVision SC6000 HS camera	2
Mf4	Displacement measurements using a high-speed camera - Phantom V12 + TEMA system	2
Mf5	Optical deformation measurements - GOM Correlate system	2
Mf6	3D laser scanning - Leica P20 3D scanner	2
Mf7	Laser vibration measurement - POLITEC PSV-400 scanning vibrometer	2
Mf8	Strain gauge measurements of deformations and vibrations - LMS Scadas Recorder SCR05, VB7 vibrometer	2
Mf9	Defectoscopic measurements - crack depth measurement, ultrasonic flaw detector	2
Mf10	Experimental modal analysis - modal hammer and LMS Scadas Recorder SCR05	2
Mf11	6D motion measurements with accelerometers - XSENS system	2
Mf12	Spatial acoustic measurements - acoustic camera	2
	Total hours	30

<b>TEACHING TOOLS USED</b>
Presentation of the possibilities of measuring equipment. Demonstration of use. Possibility of self-measurement by students.

<b>ACHIEVED SUBJECT LEARNING OUTCOMES</b>		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	<b>P8S_WK</b>	Presentation, participation in the discussion
Skills	<b>P8S_UK</b>	Presentation, participation in the discussion
Skills	<b>P8S_UO</b>	Report, participation in the discussion
Social competence	<b>P8S_KK</b>	Presentation, report, participation in the discussion
Social competence	<b>P8S_KO</b>	Report, participation in the discussion

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**

Pauly, M., Mitra, N. J., Giesen, J., Gross, M. H., & Guibas, L. J. (2005). Example-based 3D scan completion. In *Symposium on Geometry Processing* (No. CONF, pp. 23-32).

Cahill, D. G. (1990). Thermal conductivity measurement from 30 to 750 K: the 3 $\omega$  method. *Review of scientific instruments*, 61(2), 802-808.

Działak, P., Ptak, M., Karliński, J., & Iluk, A. (2014). Injury biomechanics of a mining machine operator. In *2014 IRCOBI Conference Proceedings—International Research Council on the Biomechanics of Injury* (pp. 495-505).

**SECONDARY LITERATURE:**

Fernandes, F. A., de Sousa, R. A., & Ptak, M. (2018). *Head injury simulation in road traffic accidents*. Cham: Springer International Publishing.

**SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)**

**Artur Iluk**

**artur.iluk@pwr.edu.pl**