COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optical measurement systems

Course

Field of study

Mechatronics

Year/Semester

1/2

Area of study (specialization)

Mechatronic constructions

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr inż. Dawid Kucharski

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Faculty of Mechanical Engineering

ul. Jana Pawła II 24, 60-965 Poznań.

Poom 129.

Responsible for the course/lecturer:

dr inż. Radomir Majchrowski

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Faculty of Mechanical Engineering

ul. Jana Pawła II 24, 60-965 Poznań.

Room 128.

Prerequisites

Basic knowledge of optics, physics, technics and machine parts.

Course objective

Getting to know about optical measurement systems for quality production evaluation of elements and tools manufacturing in machine, car, aviation and plastic processing industries. Laser interferometry, holography and shearography measurements. White light systems and photogrammetry measurements. Getting to know about the techniques for objects measurements with different sizes.

Course-related learning outcomes

Knowledge

A student has theoretically improved knowledge about key issues from physics and technical metrology. A student has a detailed knowledge about metrology and measurement systems including the essence of the coordinate measuring machine, building and principle of coordinate, optical measurement systems and lasers work. A student has extended knowledge of mechatronics.

Skills

A student can:

acquire the knowledge from literature, databases and others right sources (also in English) about mechatronics and other engineering issues, fits the study field; can integrate the knowledge, interpreted it, take conclusions, formulate and justify opinions;

define a further way of learning and realize the learning process;

formulate and test hypotheses about engineering issues and simple research tasks;

debate essentially.

Social competences

A student is aware of the importance and understanding of out-of-technical aspects and results of engineering activity, including environmental influence and responsibility for made decisions. A student can collaborate in a group and take a various role there.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Summative assessment:

Lectures: course final exam, written (4 questions).

Laboratory: written/oral answer + lab reports; passing rules: positive assessments for all lab exercises.

Programme content

Lectures:

1. The principle of work and construction of diode lasers used in optical measurement systems.

2. A coherent light interference phenomenon, interferometry for geometrical quantities measurements.

3. Fundamentals of classical holography, various holograms and application.

4. Fundamentals of dynamic holography.

5. Optical measurements of surface roughness and topography.

6. Optical coordinate measuring machines.

7. Photogrammetry in measurement systems.

8. Optical coordinate scanners.

Laboratory:

Lab excercises:

1. Digital holography microscopy.

2. Interferometric system for surface texture measurements.

3. Non-destructive testing (NDT) of materials – holography, shearography.

4. Data evaluations algorithms used in the modern optical measurement systems.

5. Optical coordinate measuring machines.

6. Photogrammetry in measurement systems.

7. Optical coordinate scanners.

Teaching methods

Lectures: oral presentation with illustrated examples on a blackboard, discussions and tasks analysis.

Laboratory: lab experiments, tasks solving, discussions.

Bibliography

Basic

1. K. Patorski, M. Kujawińska, L. Sałbut, Interferometria laserowa z automatyczną analizą obrazu, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.

2. B. Ziętek, Optoelektronika, Wydawnictwo Uniwersytetu Mikołaja Kopernika, 2005.

3. E. Ratajczyk, Współrzędnościowa technika pomiarowa, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2005.

4. R. Leach, Optical Measurement of Surface Topography, R. Leach, Ed., Springer Science & Business Media, Berlin, Heidelberg (2011) [doi:10.1007/978-3-642-12012-1].

5. T. Luhmann: Close Range Photogrammetry. Principles, techniques and applications. Whittles Publishing, 2011, ISBN for CD 978-184995-057-2, Print edition 978-1870325-50-9

Additional

1. W.E. Williams, Applications of interferometry, Methuen's monographs on physical subjects,1950.

2. R.W Cambpell, F.M. Mims, Semiconductors lasers, Howard W. Sams.

3. Th. Kreis, Handbook of Holographic Interferometry: Optical and Digital Methods, 2005.

4. R. Leach, Characterisation of Areal Surface Texture, Springer Science & Business Media (2013) [doi:10.1007/978-3-642-36458-7].

5. S. Adamczak, Pomiary geometryczne powierzchni, zarysy kształtu, falistość i chropowatość, WNT, Warszawa, 2008

6. Z. Humienny i inni, Specyfikacje geometrii wyrobów (GPS), Wydawnictwa Naukowo-Techniczne, Warszawa, 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) [1]	15	1,0

[1] delete or add other activities as appropriate