



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Non-destructive testing [S2MiBM2-INPR>BN]

Course

Field of study

Mechanical Engineering

Year/Semester

2/3

Area of study (specialization)

Production Engineering

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student should have knowledge in the field of technical metrology, reading technical drawing, knowledge of manufacturing techniques, quality control, and also have basic knowledge of physics, mechanics and materials science. He should search and use information obtained from literature (including the Internet). Understanding the need to learn and acquire new knowledge.

Course objective

Getting to know the methods of product control and non-destructive testing, types and classification of production and operational defects, as well as methods of non-destructive testing used in industry. Making the student aware of the role of identifying and eliminating product defects in modern enterprises.

Course-related learning outcomes

Knowledge:

1. The student knows the basic methods of non-destructive testing.
2. The student knows the basic groups of product defects - production and operational.

Skills:

1. In the basic scope, the student knows how to choose the method of non-destructive testing for a specific case.
2. The student is able to recognize and classify the defects of products.

Social competences:

1. Understanding the need to learn and acquire new knowledge.
2. Is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions made.
3. Is aware of the importance of recognizing and eliminating product defects in the industry.
4. Can interact and work in a group, assuming different roles in it.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Exam / Credit based on a exam consisting general scored questions [pass if 51% of points are obtained: > 50% (3.0), > 60% (3.5), > 70% (4.0), > 80% (4.5), > 90% (5.0)] carried out at the end of the semester.

Laboratory: Assessment based on aims carried out during laboratory classes, oral answer in the field of research. In order to pass the laboratories, all exercises must be passed. The form and quality of the prepared materials are assessed (description of issues, results and analysis).

Programme content

Lecture:

Product defects: definitions, classifications, general division.

Classification of manufacturing defects resulting from the use of various manufacturing techniques: defects of products after heat treatment, defects of castings, defects of bonded joints, defects of plastic products and those made with additive techniques.

Operating defects: mechanical, thermal, complex (corrosive-mechanical, thermal-mechanical).

Non-destructive testing: reasons for conducting research, possibilities, application, criteria for object evaluation.

The method using electromagnetic radiation - X-ray examinations and computed tomography - purpose, scope, principle of research.

A method that uses passive and active infrared thermography - purpose, scope, principle of research (eddy current method, mechanical extortion method, optical extortion method).

Ultrasonic flaw detection, measurement of coating thickness.

Comprehensive testing equipment.

Laboratory:

1. Development of a methodology for measuring individual critical features.
2. The use of modern measurement systems for the identification of object defects.

Topics of laboratory exercises:

- passive thermography,
- active thermography,
- non-destructive testing of coatings, defes
- 2D X-ray and 3D tomographic measurement,
- advanced tomographic measurements,
- CT data analysis,

Course topics

Lecture:

Product defects: definitions, classifications, general division.

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Non-destructive testing: reasons for conducting research, possibilities, application, criteria for object evaluation.

The method using electromagnetic radiation - X-ray examinations and computed tomography - purpose, scope, principle of research.

A method that uses passive and active infrared thermography - purpose, scope, principle of research (eddy current method, mechanical extortion method, optical extortion method).
Comprehensive testing equipment.

Teaching methods

Lecture: a lecture illustrated with a multimedia presentation containing the discussed program content
Laboratory: practical exercises, team work

Bibliography

Basic:

1. Lewińska-Romicka A.: Badania nieniszczące. Podstawy defektoskopii, WNT, Warszawa 2001
2. Wojas M., Wady wyrobów wykrywane metodami nieniszczącymi, cz.1, Wady produkcyjne, wyd. Biuro Gamma, Warszawa 2004
2. Wojas M.: Wady wyrobów wykrywane metodami nieniszczącymi, cz.2, Wady eksploatacyjne, wyd. Biuro Gamma, Warszawa 2006
3. Jakubiec W., Malinowski J.: Metrologia wielkości geometrycznych, WNT, Warszawa, 2006
4. Więcek B., De Mey G.: Termowizja w podczerwieni, PAK, Warszawa, 2011
5. Woźniak A., Ratajczyk E.: Współrzędnościowe systemy pomiarowe, OWPW Warszawa, 2016

Additional:

1. Pająk E.; Zarządzanie produkcją. Produkt, technologia, organizacja. Wydawnictwo Naukowe PWN Warszawa 2006
2. Durlik I. , Inżynieria zarządzania. Strategia i projektowanie systemów produkcyjnych. Część 1, Agencja Wydawnicza Placet, Warszawa 2000
3. Gapiński B.: Obrazowanie i pomiary w technicznej tomografii komputerowej ze szczególnym uwzględnieniem przedmiotów wykonanych technikami przyrostowymi i analizy nierówności powierzchni. Wydawnictwo Studio Poligrafia, ISBN 978-83-953889-0-3, 2019

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00