COURSE DESCRIPTION CARD - SYLLABUS

Course name
Systems of machine diagnostics

Course

Field of study
Mechanical Engineering
Area of study (specialization)
Machine Diagnostics and Measurement Systems

Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
Polish
Requirements
elective

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)

Tutorials
Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Roman Barczewski
e-mail: roman.barczewski@put.poznan.pl
tel. 61.6652684
Faculty of Mechanical Engineering
ul. Piotrowo 3, room MC119

Responsible for the course/lecturer:

Prerequisites

Fundamentals of machinery diagnostics, electrical engineering, basics of metrology and measurements,

basics of computer science (IT). Ability for self-learning and knowledge acquiring, basing on library (including e-resources) and Internet resources (e.g. Moodle).

Course objective

Expanding basic knowledge on technical diagnostics with issues related to diagnostic systems and diagnostic devices. Students improve their skills in selecting methods of diagnostic tests (including NDT tests) and the detection and identification of defects and damages. Students improve their skills in configuring the diagnostic systems.

Course-related learning outcomes

Knowledge

After completing the course, the student has knowledge on diagnostic devices and technical equipment used to detect various types of defects and damage. The student has knowledge of the systems monitoring the technical condition of machines and devices. The student knows the basic features and advantages, disadvantages and limitations of diagnostic systems and devices.

Skills

After completing the course, the student is able to propose a device and equipment for detecting various types of defects and damage of elements, machine subassemblies as well as mechanical structures. The student is able to analyse and interpret the obtained results of diagnostic tests as well as to formulate conclusions and operational recommendations. The student is able to choose the appropriate system for monitoring the operation of the indicated machines and devices.
The student is able to choose in terms of technical parameters and justify the choice in terms of reliability and economy, an appropriate system for monitoring and supervising machines (off-line / on-line) depending on the class of the machine or devices. The student is able to design the structure and configure diagnostic systems (off-line and on-line systems). The student is able to assess the usefulness of diagnostic devices and systems as well as methods and techniques for the detection of various types of defects and damage to machines, devices and their subassemblies.

Social competences

The student understands the importance of diagnostics tests in economic terms and the safety of people and the environment. The student is aware of the importance of engineering activities and responsibility for decisions related to the operation of machines and devices. The student is aware of the role of engineering staff in technical development. The student knows how to think and act creatively and proactively. He is able to organize teamwork and to cooperate while performance of tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Laboratory classes:

Short entry tests before each laboratory exercise. Assessment of knowledge and skills, as well as activity during carried out experiments. Evaluation of mastery of course content, skills and acquired competencies based on the quality of individually prepared reports. The substantive and computational

correctness, report completeness and the ability to specifying conclusions, remarks and observations are verified. Necessary condition to pass the laboratory: passing a set of laboratory exercises and getting the required number of points from entry tests and reports.

Lecture

Written or remote tests (via MOODLE platform): 10-20 issues covering the entire lecture material and issues indicated for own studies (self-studying).
Grading scale both laboratory and lecture (exam): below 60% unsatisfactory; 60-67% satisfactory, 68-75% satisfactory plus; 76-83% good; 84- 91% good plus; 92 -100% very good.

Programme content

Lectures:
Diagnostic systems and equipment used for diagnostic tests. (i.a. vibroacoustic, acoustic emission, visual testing, magnetic particle, eddy-current, liquid penetrant, ultrasonic, radiographic). Presentation of diagnostic devices and systems - basic parameters, advantages, limitations, test procedures. Off-line monitoring systems (microprocessor-based data collectors) and on-line monitoring systems (network diagnostic systems). Systems structure, tasks performed by system modules. Configuration and training of diagnostic systems.

Laboratory classes:

Performing tests with the use of diagnostic systems, devices and equipment, including: devices for measuring and analyzing vibroacoustic signals, active and passive ultrasonic testing systems (leak detectors, ultrasonic thickness gauges and flaw detectors), devices for acoustic emission, devices magnetic particle test equipment, visual testing equipment. Off-line monitoring system configuration - (microprocessor data collector). On-line monitoring system (configuration and training of the system; setting alarm and limit values of diagnostic symptoms).

The current list of exercises is available on the Moodle platform.

Teaching methods

Lectures: multimedia presentation. The content of lectures is available in electronic form before the beginning of the class, which allows comfortable and active participation in lectures.
Laboratories: the experiments are carried out on didactic stands equipped with diagnostic devices and systems.
Lectures and laboratories are fully supported on the Moodle e-learning platform. There are available: lectures, multimedia, off-line webinars, source literature (magazines, selected publications, technical notes), instructions for laboratory exercises, report templates, sample reports. It is also possible to perform exercises remotely.

Bibliography

Basic

1. Lewińska-Romicka A., Badania nieniszczące, podstawy defektoskopii, WNT W-wa, 2001.
2. Holroyd T., Acoustic Emission & Ultrasonic monitoring handbook, Coxmoor Publishing Company 2000.
3. Hlebowicz J., Endoskopia przemysłowa, Gamma Warszawa 2000.
4. Kielczyk J., Radiografia przemysłowa, Gamma Warszawa 2006.

Additional

1. 1. Nawrocki W., Sensory i systemy pomiarowe, WPP 2006.
2. GENIE - Application builder for data acquisition & control, User's guide, Advantech.
3. The technical specifications of devices and diagnostic systems.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, self-education based on e-learning resources, preparation for laboratory classes, reports, preparation for tests/exam) [1]	25	1,0

[1] delete or add other activities as appropriate