**Nazwa przedmiotu:**

Introduction to Diagnostics

**Koordynator przedmiotu:**

Szymon Gontarz, PhD

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Obowiązkowe

**Kod przedmiotu:**

150-00000-ISA-0318

**Semestr nominalny:**

6 / rok ak. 2022/2023

**Liczba punktów ECTS:**

2

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

1) Number of direct contact hours - 34, of which:
a) lecture -15 hours;
b) laboratory - 15 hours;
c) consultations - 2 hours;
d) examination - 2 hours;
2) Student's own work - 26, including:
a) literature studies: 5 hours;
b) preparation for classes: 3 hours;
c) preparation of reports from laboratory exercises: 10 hours
d) preparation of the student for the exam: 8 hours
3) TOTAL - 60 hours

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

1.2 ECTS points - number of direct contact hours - 34, of which:
a) lecture -15 hours;
b) laboratory - 15 hours;
c) consultations - 2 hours;
d) exam - 2 hours

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

1 ECTS point - number of direct contact hours - 25, of which:
a) participation in laboratory exercises - 15 hours;
b) preparation of reports from laboratory exercises: 10 hours

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład:  | 15h |
| Ćwiczenia:  | 0h |
| Laboratorium:  | 15h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

Required knowledge of mathematical analysis, the fundamentals of physics in particular the theory of vibration, mechanics and strength of materials.

**Limit liczby studentów:**

zgodnie z zarządzeniem Rektora PW

**Cel przedmiotu:**

Acquisition of knowledge in the field of mathematics, physics, chemistry and other areas appropriate for the studied direction, useful for formulating and solving simple tasks in the field of diagnostics, maintenance of technical objects. Understanding the construction and operation of diagnostic systems. Understanding the economic, social, legal and operational aspects of diagnostics and trends in the development of modern mechanical systems. Acquire the skills of analysis and identification of the way of acting, evaluation and formulation of simple engineering tasks. Understanding the seriousness of the ecological, economic, environmental, effects of worn out machines and equipment and the need to diagnose such equipment.

**Treści kształcenia:**

Lecture:
General knowledge on the principles of technical problem solving, methods and means of diagnosis.
1. Models of faults and processes.
2. Physical signal models.
3. Fault detection based on signal model.
4. Analysis of periodic signals.
5. Detection of errors and defects by means of process identification.
6. Comparison of fault detection methods.
7. Diagnostic procedures.
8. Diagnosis of damage by classification methods.
9. Diagnostic inference
10. Statistical methods in diagnostics.
11. Diagnostic experiments.

Lab:
Practical familiarization with methods and means of technical diagnostics.
1. The use of wave phenomena in the diagnosis of compressed structures.
2. Diagnosis of stress state.
3. Diagnosis of the gigacycle fatigue process.
4. Diagnostics of hydraulic actuators of hydraulic systems.
5. Diagnostics of construction using modal analysis.

**Metody oceny:**

Laboratory: Each laboratory exercise is evaluated immediately after its completion. The basis for the assessment is the correct execution of the exercise completed by the report and its oral defense. This is possible after the student has been admitted to perform the exercise after a prior verification of the student's preparation for the course. The requirement for a laboratory to be completed is to complete all the exercises provided in the program in a given semester and to pass each class on at least 3. The final grade of the laboratory is determined on the basis of the average number of grades obtained from each laboratory activity. Average corresponds, after rounding, the final evaluation.
Lecture: The lecture veryfication takes place during the written examination, according to the schedule of the examination session.
Overall rating: The total grade is the weighted average of the grades obtained from the laboratory and lecture sections. The condition of receiving a positive assessment is to pass a minimum grade of 3.0 in both the laboratory and the lecture.

**Egzamin:**

tak

**Literatura:**

1. Robert Bond Randall: 2011. Vibration-based Condition Monitoring. John Wiley & Sons, Ltd.
2. Cornelius Scheffer, Paresh Girdhar: 2004. Practical Machinery Vibration Analysis and Predictive Maintenance. Elsevier.
3. Levitt: 1997. The Handbook of Maintenance Management, Idustrial Pres Jnc.
4. Yaguo Lei, 2016, Intelligent Fault Diagnosis and Remaining Useful Life Prediction of Rotating Machinery. Elsevier.

**Witryna www przedmiotu:**

Wszystkie materiały do przedmiotu Podstawy Diagnostyki dostępne są na stronie intranetowej przedmiotu: http://Www.mechatronika.simr.pw.edu.pl po zalogowaniu. Hasło dostępu i login podane zostaną przez prowadzącego zajęcia.

**Uwagi:**

Brak.

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt 150-00000-ISA-0318\_W1:**

Has an systematized, theoretical background in the field of technical diagnostics problems.

Weryfikacja:

Discussion during the lecture, exam.

**Powiązane efekty kierunkowe:** K\_W01

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07

**Efekt 150-00000-ISA-0318\_W2:**

Possesses the general knowledge needed to understand the economic, social and legal aspects of technical diagnostics.

Weryfikacja:

Discussion during the lecture, exam.

**Powiązane efekty kierunkowe:** K\_W19, K\_W21

**Powiązane efekty obszarowe:** T1A\_W05, T1A\_W08

**Efekt 150-00000-ISA-0318\_W3:**

Possesses basic knowledge about development trends in the field of technical diagnostics.

Weryfikacja:

Discussion during the lecture, exam.

**Powiązane efekty kierunkowe:** K\_W15, K\_W16

**Powiązane efekty obszarowe:** T1A\_W03, T1A\_W04, T1A\_W07, T1A\_W04, T1A\_W07

**Efekt 150-00000-ISA-0318\_W4:**

Possesses basic knowledge of the life cycle of technical objects and understands the seriousness of the ecological aspects of technical diagnostics.

Weryfikacja:

Discussion during the lecture, exam.

**Powiązane efekty kierunkowe:** K\_W20

**Powiązane efekty obszarowe:** T1A\_W06

### Profil ogólnoakademicki - umiejętności

**Efekt 150-00000-ISA-0318\_U1:**

Has an knowledge to plan and perform diagnostic tests using appropriate methods and means.

Weryfikacja:

Short oral / written test verifying student's preparation for laboratory exercises, evaluation of the report.

**Powiązane efekty kierunkowe:** K\_U07, K\_U08

**Powiązane efekty obszarowe:** T1A\_U08, T1A\_U09, T1A\_U08, T1A\_U09

**Efekt 150-00000-ISA-0318\_U2:**

Possesses the ability to set priorities appropriately for the fulfillment of other tasks.

Weryfikacja:

Evaluation of results in laboratory exercises and assessment of the report.

**Powiązane efekty kierunkowe:** K\_U20, K\_U24

**Powiązane efekty obszarowe:** T1A\_U16, T1A\_U15

### Profil ogólnoakademicki - kompetencje społeczne

**Efekt 150-00000-ISA-0318\_K1:**

Posseses abilty to work independently and in a team.

Weryfikacja:

Assessment of tasks performed during laboratory exercises and evaluation of the report.

**Powiązane efekty kierunkowe:** K\_K02, K\_K04

**Powiązane efekty obszarowe:** T1A\_K02, T1A\_K03, T1A\_K04