**Nazwa przedmiotu:**

Diagnostics of Electric and Hybrid Vehicles

**Koordynator przedmiotu:**

dr inż. Krzysztof Więcławski

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Specjalnościowe

**Kod przedmiotu:**

406

**Semestr nominalny:**

7 / rok ak. 2022/2023

**Liczba punktów ECTS:**

3

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

1) Number of contact hours - 32 including
a) lecture - 15 hours;
c) laboratory - 15 hours;
e) consultations - 2 hours;

2. Student's own work - 45 hours, including:
a) 30 hours - ongoing preparation for laboratories and lectures (literature analysis),
b) 5 hours - completing homework assignments,
c) 10 hours - preparing for the colloquium,

3) TOGETHER - 77 hours

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

1.2 ECTS points - 32 hours including:
a) lecture - 15 hours;
b) laboratory - 15 hours;
c) consultations - 2 hours;

**Język prowadzenia zajęć:**

angielski

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

1.4 ECTS points - 35 hours, including:
a) laboratory exercises - 15 hours
b) 10 hours - preparing for laboratory exercises
c) 5 hours - preparation of results, preparation of reports
d) 5 hours - completing homework

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

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

**Wymagania wstępne:**

Basic knowledge of the MATLAB computing environment, basic mechanics, theoretical basis of electrical machines

**Limit liczby studentów:**

in accordance with the Rector's order

**Cel przedmiotu:**

The aim of the course is to familiarize the student with various aspects of the diagnostics of electric and hybrid vehicles

**Treści kształcenia:**

Lecture:
Physical fundamentals and diagnostic methods for BLDC and SRM type electric motors. Physical phenomena occurring in electric motors, damage modeling in electric motors.
Parameters of the electrochemical battery (SOC charge level, SOH quality status, Rw internal resistance, Q capacity). Methods of battery damage identification at the level of a single cell and the entire battery pack

Lab:
Basics of signal analysis, BLDC and SRM engine diagnostics based on recorded data, possibly data recording on a test bench.
Determination of electrochemical battery parameters using the Texas Instrument Impedance Tracking algorithm (SOC charge level, SOH quality status, Rw internal resistance, Q capacity) Identification of battery status on the example of the Toyota Prius package

**Metody oceny:**

Lecture: Assessment of knowledge acquired during the lecture by the colloquium written at the last lecture meeting.
Laboratory: Evaluation of the quality of software written during classes, assessment of the student's work during the exercise, if necessary, if applicable, also the assessment of the student's preparation for the exercise verified by a short entry. The final grade from the laboratory is the average grade for all exercises.
Overall mark: average mark from lecture and laboratory

**Egzamin:**

nie

**Literatura:**

1. Ocioszyński J.: „Elektronika i Elektronika Pojazdów Samochodowych” WSiP, wydanie uaktualnione 2008, Warszawa,
2. Instrukcje wykonywania ćwiczeń zamieszczone na stronie internetowej.

**Witryna www przedmiotu:**

Wykład: http://www.simr.pw.edu.pl/Wydzial-SiMR/Studia/Kierunki-studiow/Inzynieria-Pojazdow-Elektrycznych-i-Hybrydowych http://www.mechatronika.simr.pw.edu.pl/

**Uwagi:**

Brak

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt W1:**

 The student has knowledge of the construction of electric motors BLDC and SRM, knows the basic damage occurring in this engine and knows how the damage can affect the diagnostic signal

Weryfikacja:

Verification of knowledge is carried out by assessing the student's answer to a problem question, given in writing during the colloquium

**Powiązane efekty kierunkowe:** K\_W01, K\_W15, K\_W17, K\_W18, K\_W19, K\_W20

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07, T1A\_W03, T1A\_W04, T1A\_W07, T1A\_W03, T1A\_W04, T1A\_W07, T1A\_W03, T1A\_W04, T1A\_W07, T1A\_W05, T1A\_W06

**Efekt W2:**

The student has knowledge about the diagnosis of the electrochemical battery and methods for determining its parameters, and also knows how to interpret the values of these parameters.

Weryfikacja:

Verification of knowledge is carried out by assessing the student's answer to a problem question, given in writing during the colloquium

**Powiązane efekty kierunkowe:** K\_W01, K\_W19, K\_W20

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07, T1A\_W05, T1A\_W06

### Profil ogólnoakademicki - umiejętności

**Efekt U1:**

The student is able to analyze the selected diagnostic signal in terms of estimating the characteristic features of the signal in order to diagnose or detect motor damage.

Weryfikacja:

Verification is carried out by assessing the implementation of tasks set during the laboratory exercise and described in the instructions for the exercise

**Powiązane efekty kierunkowe:** K\_U02, K\_U08, K\_U10, K\_U15, K\_U16, K\_U17, K\_U18

**Powiązane efekty obszarowe:** T1A\_U02, T1A\_U08, T1A\_U09, T1A\_U07, T1A\_U08, T1A\_U09, T1A\_U12, T1A\_U16, T1A\_U12, T1A\_U16, T1A\_U01, T1A\_U16, T1A\_U16

**Efekt U2:**

Student is able to explain the operation of methods for determining battery parameters, and is able to interpret the values of these parameters. Student is able to quickly identify damaged targets in a packet of electrochemical batteries used in electric and hybrid vehicles.

Weryfikacja:

Verification is carried out by assessing the implementation of tasks set during the laboratory exercise and described in the instructions for the exercise

**Powiązane efekty kierunkowe:** K\_U01, K\_U02, K\_U06, K\_U07, K\_U11, K\_U12

**Powiązane efekty obszarowe:** T1A\_U01, T1A\_U02, T1A\_U05, T1A\_U08, T1A\_U09, T1A\_U08, T1A\_U09, T1A\_U07, T1A\_U08