



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modern methods of testing vehicles and machines [S1Elmob1>PO-EA-NMBP]

### Course

Field of study

Electromobility

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

prof. dr hab. inż. Paweł Fuć  
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### Lecturers

### Prerequisites

The student starting this course should have basic knowledge of mathematics, physics and metrology.

### Course objective

Acquiring knowledge about modern vehicle testing methodology in terms of current regulations. Understanding the operation of static and dynamic dynamometers and conducting tests in simulated, real operating conditions. Presentation of the current research cycles along with the trends in their development in the country and in the world. Showing the assembly process, the method of operation of the apparatus and measurements of the energy consumption of electric vehicles. Approximation of the implementation process of the registered cycle on the dynamometer and basic conversion of electric units.

### Course-related learning outcomes

Knowledge:

1. Has knowledge of vehicle energy consumption testing methods.
2. Has knowledge of the applicable approval regulations and their current development trends.
3. Has knowledge of how to conduct research in vehicles real operating conditions.
4. Knows the current tendencies in the field of energy consumption measurements by electric cars.

#### Skills:

1. Can interpret the results of electric vehicle tests.
2. Is able to recognize the type of dynamometer and discuss its mode of operation.
3. Is able to discuss trends in the field of electric vehicle modern measurement methods.

#### Social competences:

Students understand the principle of operation of post-treatment equipment and the methods of conducting tests.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: the knowledge acquired during the lecture is verified during a written exam during the exam session. The exam consists of open questions, scored depending on the difficulty level. Passing point: 50% of the total number of points. Exam issues are sent to the group by e-mail using the university's e-mail distribution list system 2 weeks before the exam date and discussed during the last lecture.

### Programme content

Laboratory tests of vehicles and their components (static dynamometer, types of brakes with a discussion of their advantages and disadvantages - air, water, eddy current). The occurrence of transients and the essence of measurements in real operating conditions - examples of low compliance with approval tests. Discussion of the legitimacy and possibilities of mapping tests on a dynamic brake stand. Overview of the methodology of approval tests included in the legislation. Discussion of the main factors influencing energy consumption on the example of vehicle motion resistance. Basic physical quantities describing the flow of current in circuits and carrying out activities on them. The content of the on-board diagnostics system and its use in vehicle research - the OBD scanner and subsystems included in it. Influence of elements responsible for comfort on the distance that an electric car can drive.

### Course topics

none

### Teaching methods

A multimedia presentation (which includes: drawings, photos, animations, films) supplemented with examples given on the board. Introducing a new topic, preceded by a reminder of related content, known to students from other lectures, or from previous classes in the described subject.

### Bibliography

#### Basic

1. Merkisz J., Pielecha I.: Układy elektryczne pojazdów hybrydowych, Wydawnictwo Politechniki Poznańskiej, Poznań 2015.
2. Fic B.: Samochody elektryczne, Wydawnictwo i handel Książkami "KaBe", Krosno 2019.
3. COMMISSION REGULATION (EU) 2018/1832 of 5 November 2018 amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) 2017/1151 for the purpose of improving the emission type approval tests and procedures for light passenger and commercial vehicles, including those for in-service conformity and real-driving emissions and introducing devices for monitoring the consumption of fuel and electric energy.

#### Additional

1. Praca zbiorowa pod redakcją Jacka Pielechy, Badania emisji zanieczyszczeń silników spalinowych, Wydawnictwo Politechniki Poznańskiej, Poznań 2017.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	28	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	13	0,50