



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Sensors and diagnostics in vehicles

Course

Field of study

Electromobility

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr inż. Jarosław Jajczyk

Responsible for the course/lecturer:

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Faculty of Control, Robotics and Electrical
Engineering

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Prerequisites

Basic knowledge of electrical engineering, electronics and metrology. Linking physical phenomena with the principles of operation of technical devices. Interpretation of electrical diagrams. Connecting electrical circuits. Collaboration in a team (laboratory group). Awareness of the importance and need to use electrical and electronic devices in the work of an engineer. Ability to expand one's competences.

Course objective

Getting to know theoretical and practical problems related to the functioning of sensors and diagnosing electrical and electronic systems used in motor vehicles.



Course-related learning outcomes

Knowledge

He knows how to use physical phenomena and knowledge of mechanics, electricity and metrology to understand the functioning of sensors and carry out diagnostics of car accessories. Can determine the operational parameters of devices found in motor vehicles, using measuring equipment and diagnosscopes. He knows and understands the fundamental dilemmas of modern civilization related to the mass use of vehicles.

Skills

He can test and diagnose elements, systems and devices related to the functioning of vehicles. Is able to plan and carry out experiments, including measurements of basic measurable quantities characteristic for sensors used in vehicles and for electrical systems used in them. Can, with the use of appropriately selected methods and tools, make a critical analysis and assess the correct functioning of the tested elements and systems. He can use technical documentation and descriptions of research procedures contained therein.

Social competences

Understands the importance of knowledge in solving problems in the field of diagnostics and vehicle operation, and the need for its continuous supplementing and expansion. Is aware of the need to use sensors in electrical and electronic systems in vehicles and the use of meters and diagnosscopes in testing the correct operation of electrical components and systems of vehicles. Has the ability to communicate the acquired knowledge in an understandable way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

- assessment of knowledge and skills demonstrated in the written or oral problem-specific exam.

Laboratory:

- test and favoring knowledge necessary for the accomplishment of problems in the area of laboratory tasks,
- evaluation of the reports of laboratory tests,
- evaluation of the completed technical report (paper) on sensors and diagnostics in vehicles.

Programme content

Lecture:

Structure, functional properties, technical parameters, design solutions and methods of testing and diagnosing converters of non-electrical quantities into electrical quantities used in automotive systems. Analyzes of physical and operational properties of sensors of: linear and angular displacements,



rotational speed, crankshaft position, temperature, pressure, air flow meters, accelerations, vibrations (e.g. detonation sensors), force and lambda probes. Test and functional diagnostics of automotive electrical and electronic systems. Functional properties and technical solutions of automotive computer diagnosscopes as well as testers and diagnostic devices used for testing and servicing electrical equipment of vehicles. Typical faults and procedures for technical diagnostics of automotive electrical and electronic devices. Interpretation of the results of diagnostic tests.

Laboratory:

Research and analysis of sensor parameters: rotational speed and crankshaft position, air flow meters, lambda sensors, pressure, temperature, vibration sensors, linear and angular positions; tests and diagnostics of alternators and batteries, diagnosis with computer diagnosscopes through the unified diagnostic connector of the integrated Motronic and Mono-Motronic combustion engine control systems, as well as other automotive systems.

Teaching methods

Lecture:

Lecture with multimedia presentation (including: drawings, photographs, animations, sound, films) supplemented with examples given on the board. Presenting a new topic preceded by a reminder of related content, known to students from other subjects. Taking into account various aspects of the presented issues, including: economic, ecological, legal, social, etc.

Laboratory:

Demonstrations of practical nuances specific to the realised issues, working in teams.

Bibliography

Basic

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2. Gajek A., Juda Z., Czujniki, WKiŁ, Warszawa 2008.
3. Gustof P.: Badania techniczne z diagnostyką pojazdów samochodowych, Wydawnictwo Politechniki Śląskiej, 2013.
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10. Kasedorf J.: Układy wtryskowe i katalizatory, WKiŁ, Warszawa 1998.

Additional

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2. Szymkowiak M., Bednarek K., Jajczyk J., Bugała A., Koncepcja stanowiska do badań czujników Halla położenia liniowych i kątowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 105, Poznań 2020, s. 95-110, DOI: 10.21008/j.1897-0737.2020.105.0008.
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10. Jajczyk J., Filipiak M.: Badanie układu turbodoładowania w silnikach spalinowych ZS, Poznan University of Technology Academic Journals, Electrical Engineering, Issue 92, ISSN 1897-0737, Published by Poznan University of Technology (2017), Perfekt Druk, s. 73-82

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	35	1,0

¹ delete or add other activities as appropriate