STUDY MODULE DESCRIPTION FORM

Name of the module/subject **On-Board Diagnostic Systems**		Code **1010622231010620540**
Field of study **Mechanical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **Internal Combustion Engines**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **2** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student knows about: motor vehicles diagnosing process in the aspect of processes diagnostics and technical objects, types of diagnostics and diagnostic analysis methods, relations taking place during systems diagnosing process and physical measures and tools being considered at the research process. The student knows about analysis of signals obtained from different processes sources placed in a vehicle. The student is aware of possibilities how to analyze measurement signals, depending on the taken domain of a research assessment. The student is aware of what on-board diagnostic system is, what purposes of its using are.
2	**Skills**	One knows how to analyze different types of vehicle diagnostic systems according to taken criteria, knowledge and abilities from processes and technical objects diagnostics. The student can design simple diagnostic system for a vehicle on the basis of learned scientific part of knowledge connected with a design, systems working principles, diagnosing and steering procedures. The student knows how to use absorbed knowledge in the analysis of the specific diagnostic case of vehicle element in the range of the OBD diagnostic procedure. The student is able to analyze recorded signal with its qualification.
3	**Social competencies**	The student can cooperate with others in a group, playing among them different roles. The student is able to define priorities that are important for solving given tasks. The student single-handedly solves problems, learns and improving acquired knowledge and abilities.

Assumptions and objectives of the course:

Detailed recognition and analysis of problems concerned on-board diagnostic systems used in vehicles, taking into consideration the problem of using different sources of a drive for vehicle and steering strategy of their operation. That is why among aims of the lecture is not only the analysis of the on-board diagnostic systems used in classical combustion propulsions, but also taking into consideration of the OBD systems implementation for alternative propulsions.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student has a ordered, solid theoretical knowledge about means of transport, general characteristics and classification of them, their functional features and basic technical-operational parameters, basic kinematic pair, mechanisms and assemblies, sources of a drive, propulsions systems, types. - [K2A_W14]

2. The student is learned the basic knowledge about computing system, their types and description, amount of information, coding and data compression, information nets, allocation of information and their transfer, means and standards of information transfer, the range of the information technology application in transport, specified information systems. K2A_W15 - [K2A_W15]

3. The student is knowledgeable about technical exploitation, reliability and system security and knows: praxeological, technical and economical aspects of transport systems operation, mathematical basics of reliability theory, reliability models of technical systems, physical and statistical interpretation of the of reliability factors. - [K2A_W16]

4. The student has a knowledge about metrology and knows: measurement methods, measurement tools characteristics and their classification according to their application, working principles and metrological features, workshop metrology, sensors and measurements transducers, results recording, measurements systems, measurement errors. - [K2A_W17]

Skills:

1. The student can get pieces of information of literature, from internet, data base and other sources, in Polish and foreign languages, the student can integrate obtained information, can interpret and make conclusions, make and interpret opinions. - [K2A_U01]

2. The student can use different techniques in the work surroundings and others, using a formal design notation, engineering drawing, concepts and definitions from the range of the branch of study. - [K2A_U02]

3. The student can use the native and English languages fluently with the skill of understanding technical papers and using dictionaries of the technical objects description in the specified technical domain (understanding technical terminology). - [K2A_U03]

4. The student can use in verbal communication one additional foreign language, knows in this language how to describe issues from the study branch, can prepare technical documentation of description-drawing sort of the engineering task, transport and/or logistics ones. - [K2A_U04]

5. The student is able to do a self-education and can point at directions of the further education with the use of modern educational tools, such as mobile lectures, internet pages and data bases, didactical programs, books and electronical newspapers. - [K2A_U05]

6. The student is able to prepare servicing instruction and repair of a machine from the group of devices and means of transport, including chosen speciality. - [K2A_U06]

Social competencies:

1. The student understands the need and knows possibilities on continuous learning, knows the need to learn a new things to improve work skills, can organize learning process of other people. - [K2A_K01]

2. The student can think and operate in a business way, make decisions, be active for an employer and society development. - [K2A_K02]

3. The student is conscious of giving learned knowledge to other people from society, try to give understandable pieces of information, presents different solutions and points of view. - [K2A_K03]

Assessment methods of study outcomes

Kolokwium zaliczeniowe

Course description

Introduction to the diagnostics of processes and technical objects. Division of a diagnostics in the point of view of life cycles of technical object and aims of its use. Analysis of relations in the diagnostic process, assessment of sources and diagnostic information values and diagnostic parameters, genesis of diagnostic method choice and placement of a measurement for a measure that gives information on the process and technical object state, diagnostic signals and symptoms (bio-mechanical depiction), cause-result relations between an object state and a signal, diagnostics algorithms and processes generation models, techniques of diagnostic signal analysis.

Introduction of vehicles on-board diagnostics, in which there are purposes of its application, law and technical requirements, design features and areas of on-board vehicle diagnostics use. Law regulations, technical and toxic emission norms versus OBD diagnostics. Types of vehicles diagnostic systems. Design of OBD systems including their generations. Operation of the OBD system, taking into consideration emission related elements classification, diagnostic tests and their types. Principles of a placement of emission related elements and decisive strategies. Characteristics of the OBD systems diagnostic tests, diagnostic information and communication. Features of diagnostic information scanners in the OBD II/EOBD systems. Parts of OBD systems and their features. Types of the computing systems used in different OBD devices in the point of view of the communication strategy in the system and postprocessing of diagnostic data and possibilities of their development in future communication architectures of vehicle information nets. Analysis of diagnostic data obtained from the OBD system and decisive procedures. Servicing and repair of vehicles equipped with OBD systems.

Basic bibliography:

1. Ekologiczne problemy silników spalinowych. T. 1 i 2 / Jerzy Merkisz ; Politechnika Poznańska. Wydaw. PP, 1999.
2. Pokładowe systemy diagnostyczne pojazdów samochodowych / Jerzy Merkisz, Stanisław Mazurek> WKiŁ 2002.
3. Stan cieplny silnika spalinowego a emisja związków szkodliwych / Piotr Bielaczyc, Jerzy Merkisz, Jacek Pielecha. Wydaw. Politechniki Poznańskiej, 2001.
4. Pokładowe systemy diagnostyczne pojazdów samochodowych / Jerzy Merkisz, Stanisław Mazurek. Wydawnictwa Komunikacji i Łączności, 2004.
5. Alternatywne napędy pojazdów / Jerzy Merkisz, Ireneusz Pielecha. Wydawnictwo Politechniki Poznańskiej, 2006.
6. Pokładowe systemy diagnostyczne pojazdów samochodowych / Jerzy Merkisz, Stanisław Mazurek. Wydawnictwa Komunikacji i Łączności, 2007.
7. Pragmatyczne podstawy ochrony powietrza atmosferycznego w transporcie drogowym / Jerzy Merkisz, Jacek Pielecha, Stanisław Radzimirski. Wydawnictwo Politechniki Poznańskiej, 2009.
8. Emisja zanieczyszczeń motoryzacyjnych w świetle nowych przepisów Unii Europejskiej / Jerzy Merkisz, Jacek Pielecha, Stanisław Radzimirski. Wydawnictwa Komunikacji i Łączności, 2012.
9. Pokładowe urządzenia rejestrujące w samochodach / Jerzy Merkisz, Stanisław Mazurek, Jacek Pielecha. Wydawnictwo Politechniki Poznańskiej, 2007.
10. Układy oczyszczania spalin i pokładowe systemy diagnostyczne samochodów OBD. Uwe Rokosch, WKiŁ 2007.

Additional bibliography:

1. Badania stanowiskowe i diagnostyka. Kazimierz Sitek, Stanisław Syta, WKiŁ 2011.
2. Diagnostyka samochodów osobowych. Krzysztof Trzeciak, WKiŁ 2010.
3. Diagnostyka pokładowa. Standard OBD II/EOBD - poradnik serwisowy. Stefan Myszkowski.
4. Magistrale wymiany danych w pojazdach. Protokoły i standardy. W. Zimmermann, R. Schmidgall. WKiŁ.
5. Samochodowe magistrale danych. Martin Frei. WKiŁ.

Result of average student's workload

Activity	Time (working hours)
1. Przygotowanie do wykładu	5
2. Udział w wykładzie	30
3. Utrwalanie treści wykładu	10
4. Konsultacje	6
5. Przygotowanie do zaliczenia	10
6. Udział w zaliczeniu	2

Student's workload

Source of workload	hours	ECTS
Total workload	63	3
Contact hours	38	1
Practical activities	0	0