STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Environment and Ecology		**1010611271010623054**
Field of study: **Mechanical Engineering**	Profile of study (general academic, practical): **general academic**	Year /Semester: **4 / 7**
Elective path/specialty: **Motor Vehicles**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **1** Classes: **1** Laboratory: **1** Project/seminars: **-**		No. of credits: **4**
Status of the course in the study program (Basic, major, other): **other**	(university-wide, from another field): **university-wide**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **100 4%** **100 4%**

Responsible for subject / lecturer:

DEng. Andrzej Ziółkowski
email: andrzej.j.ziolkowski@put.poznan.pl
tel. +48 62 665-20-04
of Transport Engineering
Piotrowo str. 3, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student should have general knowledge in chemistry, physics and mathematics. In addition, he should have knowledge of the construction of the vehicle and the operation of the internal combustion engine. He should have general knowledge of environmental.
2	**Skills**	The student is able to integrate the obtained information, make their interpretation, draw conclusions, formulate and justify opinions, has general knowledge of health and safety.
3	**Social competencies**	The student is aware of the risks associated with the emission of harmful compounds to the atmosphere and is aware of the ecological nature of negative social behavior on health and human safety in transport and industry.

Assumptions and objectives of the course:

Acquainting with the subject of basic threats to the natural environment caused by human anthropogenic activity. Defining the basic harmful and toxic compounds emitted to the atmosphere as a result of burning fossil fuels. Explanation of the reasons for their formation and sources in various fields: heavy industry, transport and households. Getting to know the methods of measurement of pollutant emission in laboratory conditions and in real operating conditions. Presentation and analysis of methods to reduce emissions from automotive sources.

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

Knowledge:

1. "Has basic knowledge in the field of chemistry, in the field of the structure of the periodic table of elements and their properties, the theory of chemical bonds, organic and inorganic compounds, types of chemical reactions, chemical analysis ... - [M1_W03]

2. Has an extended basic knowledge necessary for understanding specialist subjects and specialist knowledge about construction, methods of construction, manufacturing and operation ... - [M1_W19]

3. Has elementary knowledge about the impact of machinery and technology on the natural environment and global energy balance sheets - [M1_W21]

4. Has elementary knowledge about the impact of changes in technology on the organization of social life and the health and psyche of individuals in human-machine contact - [M1_W22]

Skills:

1. Is able to properly use modern equipment to measure the main physical quantities used in machine testing and production control - [M1_U04]

2. He can create a circuit diagram, select elements and perform basic calculations using ready-made computational packages of mechanical, hydrostatic, electric or hybrid machine drive system. - [M1_U16]

3. He can assess the material, environmental and labor costs to create a simple machine - [M1_U11]

Social competencies:
1. Is ready to critically evaluate your knowledge and content - [M1_K01]
2. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in the event of difficulties in solving the problem - [M2_K02]

Assessment methods of study outcomes
The exam is carried out after a series of lectures and exercises including program content presented during classes. The most important include: biogenic and anthropogenic sources of pollutant emissions, toxic compounds and reasons for their formation, homologation regulations in the scope of pollutant emissions for vehicles of various categories, methods of measuring pollutant emissions, methods of reducing emissions, methods of energy recovery.

Course description
onducting a lecture and exercises containing the following content:
1. Anthropogenic and biogenic sources of pollutant emissions.
2. Harmful and toxic exhaust fumes - the type, causes of their formation.
3. Certificates of approval for pollutant emissions for vehicles of different categories.
4. Methods of measurement of pollutant emission in laboratory conditions.
5. Methods of measurement of pollutant emissions in conditions of real operation.
6. Methods to reduce pollutant emissions - motor and non-motor emissions.
7. Exhaust energy recovery systems.
8. Energy balance of the drive system.
9. Calculation of emission tests.

Basic bibliography:

1. Merkisz J., Pielecha I., Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006.
2. Fuc. P., Merkisz J., Lijewski P., Fizykochemiczne aspekty budowy i eksploatacji filtrów cząstek stałych. Wydawnictwo Politechniki Poznańskiej, 2016.
3. Merkisz J., Pielecha J., Emisja cząstek stałych ze źródeł motoryzacyjnych. Wydawnictwo Politechniki Poznańskiej, 2014.
4. Merkisz J., Fuć P., Pielecha J., Metody pomiaru emisji związków szkodliwych spalin w rzeczywistych warunkach ruchu pojazdów samochodowych. Oficyna Wydawnicza Politechniki Warszawskiej 2014.
5. Jacyna M., Merkisz J., Kształtowanie systemu transportowego z uwzględnieniem emisji zanieczyszczeń w rzeczywistych warunkach ruchu drogowego. Oficyna Wydawnicza Politechniki Warszawskiej 2014.
6. Wajand J.A., Wajand J.T., Tłokowe silniki spalinowe średnio- i szybkoobrotowe, WNT, 2005.

Additional bibliography:

1. Pielecha J., Badania emisji zanieczyszczeń silników spalinowych. Wydawnictwo Politechniki Poznańskiej 2017.
2. Serdecki W., Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej, 2012.
3. Journals papers of Combustion Engines, Transportation Research, Transportation
4. Digital library of Society of Automotive Engineers

Result of average student's workload

Activity	**Time (working hours)**
1. Preparation for the lecture	5
2. Participation in the lecture	15
3. Consultations for the lecture	1
4. Preparation for passing the lecture	5
5. Preparation for exercises	5
6. Participation in exercises	15
7. Consultations for exercises	1
8. Preparation for passing the exercises	5

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	75	4
Contact hours	15	2
Practical activities	60	2