

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Electronics in Means of Transport</b>		Code <b>1010621361010622371</b>
Field of study <b>Transport</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Railway Transport</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>1</b> Classes: <b>-</b> Laboratory: <b>1</b> Project/seminars: <b>-</b>		No. of credits <b>2</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>2 100%</b> <b>2 100%</b>
<b>Responsible for subject / lecturer:</b>  PhD Maciej Babiak email: maciej.babiak@put.poznan.pl tel. 616652049 Faculty of Transport Engineering ul. Piotrowo 3 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	The basics of electricity. Basic knowledge about the construction of modern means of transport.
2	<b>Skills</b>	Ability to obtain information from diagrams, sketches, technical drawings, charts.
3	<b>Social competencies</b>	Competences in the field of interpersonal communication.
<b>Assumptions and objectives of the course:</b> Acquiring basic knowledge about the use of electronics in modern means of transport. Understanding the operation of control systems based on sensors and actuators, in particular control systems for internal combustion engines, but also broadly understood safety systems, comfort and environmental protection. Acquainting with the principle of operation of basic sensors and actuators used in means of transport. Awareness of the necessity of using on-board diagnostic systems and presenting the principles of their operation.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Has basic knowledge of electronics, knows: basic concepts and terms used in electronics, basic control systems, construction, properties, characteristics and parameters of basic electronic components, electronic measuring and driving systems, elements of microprocessor technology - [K1A_W18]		
2. He has a basic knowledge of the impact of transport on the pollution of the natural environment and people, research methods and criteria for assessing environmental pollution by transporting vibrations, noise, fumes and consumables, methods of minimizing the impact of transport on the environment - [K1A_W24]		
3. Ma podstawową wiedzę z zakresu diagnostyki technicznej środków transportu oraz metod i sposobów rozwiązywania zagadnień oceny ich stanu technicznego i prognozowania, zna: warunki diagnozowania obiektów technicznych, istotę diagnostyki technicznej w zastosowaniu do środków transportu, zadania i cele diagnostyki technicznej - [K1A_W25]		
<b>Skills:</b>		

<p>1. Can acquire information from literature, the Internet, databases and other sources, in Polish and foreign languages, can integrate the information obtained, interpret and draw conclusions from them, and create and justify opinions - [K1A_U01]</p> <p>2. Is able to analyze objects and technical solutions, is able to search in catalogs and on manufacturers' websites ready components of machines and devices, including means and transport and storage devices, assess their suitability for use in their own technical and organizational projects - [K1A_U10]</p> <p>3. Is able to plan and carry out a research experiment using measuring equipment, computer simulations, is able to perform measurements, such as temperature measurements using liquid thermometers, thermistor, thermocouple, velocity and flow rate using turbine, laser and ultrasonic flowmeters, and interpret results and draw conclusions - [K1A_U07]</p>
--

<p><b>Social competencies:</b></p> <p>1. He understands the need and knows the possibilities of continuous training, knows the need to acquire new knowledge for professional development - [K1A_K01]</p> <p>2. Is aware of the importance and understands the non-technical aspects and effects of the transport engineer's activities and its impact on the environment and the responsibility for the decisions made, the consequences of own actions in the short and long term - [K1A_K02]</p>
---

<b>Assessment methods of study outcomes</b>
---

Assessment of student's preparation for conducting laboratory exercises. Assessment of activity during the course. Evaluation of the report on laboratory exercises. Final written test from the lecture.

<b>Course description</b>
---------------------------

Basics of electrical measurements in means of transport. Electronically controlled power systems for spark-ignition and compression-ignition engines. Electronic equipment of means of transport in terms of safety, comfort and environmental protection. Investigation of sensor signals and actuators of electronic means of transport. The use of electronic systems to perform diagnostics of technical devices.

<b>Basic bibliography:</b>
----------------------------

1. Herner Anton, Riehl Hans Jurgen, Elektrotechnika i elektronika w pojazdach samochodowych, WKŁ, Warszawa 2013
2. Bosch, Sterowanie silników o zapłonie iskrowym. Zasada działania. Podzespoły, WKŁ, Warszawa 2013
3. Bosch, Sterowanie silników o zapłonie iskrowym. Układy Motronic, WKŁ, Warszawa 2007
4. Bosch, Sterowanie silników o zapłonie samoczynnym, WKŁ, Warszawa 2006
5. Bosch, Układy wtryskowe Unit Injector System/Unit Pump System (UIS/UPS), Warszawa 2014
6. Bosch, Zasobnikowe układy wtryskowe Common Rail, WKŁ, Warszawa 2009
7. Bosch, Czujniki w pojazdach samochodowych, WKŁ, Warszawa 2014
8. Uwe Rokosch, Układy oczyszczania spalin i pokładowe systemy diagnostyczne samochodów OBD, WKŁ Warszawa 2007
9. Bosch, Sieci wymiany danych w pojazdach samochodowych, WKŁ, Warszawa 2016

<b>Additional bibliography:</b>
---------------------------------

1. Tadeusz Kaczorek, Andrzej Dzieliński, Włodzimierz Dąbrowski, Rafał Łopatka, Podstawy teorii sterowania, Wydawnictwa Naukowo-Techniczne, Warszawa 2005
2. Kozak W.: Fyzykochemiczne podstawy regulacji i sterowania silników spalinowych. Wydawnictwo Politechniki Poznańskiej 2011

<b>Result of average student's workload</b>
---

Activity	Time (working hours)
1. Preparation for the lecture	1
2. Participation in the lecture	15
3. Consolidation of the lecture content	2
4. Consultations related to the lecture	2
5. Preparation for test	5
6. Test (lecture)	1
7. Preparation for laboratory exercises	3
8. Participation in laboratory exercises	15
9. Consolidation of the laboratory exercises content	3
10. Consultations related to the laboratory excercises	2
11. Preparation for test	5
12. Test participation (laboratory exercises)	1

<b>Student's workload</b>
---------------------------

<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	55	2
Contact hours	36	1
Practical activities	29	1