

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Electrical and electronic systems in industry and vehicles		Code 1010321361010324813
Field of study Electrical Engineering	Profile of study (general academic, practical) general academic	Year /Semester 3 / 6
Elective path/specialty Electrical and Computer Systems in	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: 30 Classes: - Laboratory: 30 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 %) 4 100% 4 100%
Responsible for subject / lecturer: Dr inż. Karol Bednarek email: karol.bednarek@put.poznan.pl tel. 616652659 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of electrical engineering, electronics and electrical machines.
2	Skills	Linking physics with the principles of operation of technical equipment. Interpretation of wiring diagrams. Combining electrical circuits. Collaboration in a team (group of laboratory).
3	Social competencies	Awareness of the importance and need for the use of electrical and electronic engineering work. The ability to expand its powers.
Assumptions and objectives of the course: Knowledge of both theoretical and practical problems associated with the operation and diagnosis of electrical and electronic equipment used in industry and motor vehicles.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. use of physical phenomena and principles of mechanics to understand and diagnose the operation of automotive accessories and industrial equipment - [K_W03+, K_W04+] 2. define the operating parameters of industrial equipment and occurring in vehicles - [K_W13++]		
Skills: 1. to analyze and evaluate the technical condition of equipment and electrical and electronic components used in industry and vehicles - [K_U05+, K_U11++] 2. assemble, run and diagnose basic devices and operating systems in vehicles - [K_U06+]		
Social competencies: 1. awareness of the need for electrical and electronic industry and vehicles, and the ability to communicate in a meaningful way knowledge - [K_K05+]		
Assessment methods of study outcomes		

<p>Lecture:</p> <ul style="list-style-type: none"> - assess the knowledge and skills demonstrated during the examination of a problematic, realized in the form of written and oral. <p>Laboratory:</p> <ul style="list-style-type: none"> - assessment of knowledge and skills related to the implementation of laboratory exercises, - checking and rewarding knowledge and skills presented in the course of activities - evaluation of the completed technical report (paper) on modern electrical and electronic systems used in industry and in vehicles. <p>Get extra points for the activity in the classroom, and in particular for:</p> <ul style="list-style-type: none"> - making attempts to solve the problems posed in the classroom, - ability to work as a team.

Course description

Functional properties, specifications, designs and test methods for circuit elements: a static power supply (batteries) and dynamic (alternators), engine start, classical and electronic ignition systems, electronic fuel injection systems, lighting and signaling devices. Transmitters on the size of non-electrical quantities electrical systems used in the automotive (sensor: linear and angular displacement, speed and crankshaft position, temperature, pressure, air flow, and oxygen sensor) - construction, principle of operation, specifications and methods of diagnosis. Vehicle accessory systems. Updated 2017: Energy storage devices used in industry and electric vehicles.

Update 2017:

Applied methods of education:

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 issues presented, including: economic, environmental, legal, social, etc .;

laboratory - demonstrations of practical nuances specific to the issues, working in teams.

Basic bibliography:

1. Denton T.: Automobile electrical and electronic systems, Arnold, London 2012.
2. Herner A., Riehl H. J.: Elektrotechnika i elektronika w pojazdach samochodowych, WKiŁ, Warszawa 2014.
3. Pacholski K.: Elektryczne i elektroniczne wyposażenie pojazdów samochodowych, WKiŁ, Warszawa 2014.
4. Rudnicki M.: Diagnostyka i naprawa samochodowych instalacji elektrycznych - samochody z grupy VAG - Skoda (E-book), Wiedza i Praktyka, 2013.
5. Ocioszyński J.: Zespoły elektryczne i elektroniczne w samochodach, WSiP, Warszawa 2008.
6. Kasedorf J.: Układy wtryskowe i katalizatory, WKiŁ, Warszawa 1998.
7. Kowalski B.: Badania i diagnostyka samochodowych urządzeń elektrycznych, WKiŁ, Warszawa 1981.
8. Konopiński M.: Elektronika w technice motoryzacyjnej, WKiŁ, Warszawa 1987.

Additional bibliography:

1. Bednarek K., Bugała A.: Własności użytkowe akumulatorów kwasowo-ołowiowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 47-60.
2. Bednarek K., Kasprzyk L.: Zasobniki energii w systemach elektrycznych, Poznan University of Technology Academic Journals, Electrical Engineering, Poznań, No 69, Poznań 2012, p. 199-218.
3. Kasprzyk L., Bednarek K., Dobór hybrydowego zasobnika energii do pojazdu elektrycznego, Przegląd Elektrotechniczny, No 12 (91), 2015, s. 129-132.
4. Praca zbiorowa: Czujniki w pojazdach samochodowych. Informatory techniczne Bosch, WKiŁ, Warszawa 2010.
5. Gajek A., Juda Z., Czujniki, WKiŁ, Warszawa 2008.
6. Sitek K.: Diagnostyka samochodowa, Wydawnictwo AUTO, Warszawa 1999.

Result of average student's workload

Activity	Time (working hours)
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1. participation in class lectures	30	
2. participation in laboratory classes	30	
3. participate in the consultations on the lecture	6	
4. participate in the consultations on the lab	6	
5. preparation for lecture classes	5	
6. preparation laboratory	14	
7. study reports	12	
8. exam preparation	15	
9. participation in the exam	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	120	4
Contact hours	74	3
Practical activities	62	2