STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Electrical and electronic systems in industry and vehicles**		Code **1010325341010324813**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **general academic**	Year /Semester **2 / 4**
Elective path/specialty **Electrical and Computer Systems in**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **9** Classes: **-** Laboratory: **9** Project/seminars: **-**		No. of credits **2**
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 %) **2 100%** **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrical engineering, electronics, microprocessor technology 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, electronic and computer components and equipment in the work of an engineer. 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 systems 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++]
2. use and apply modern solutions in the electrical and electronic industry and vehicles - [K_W04+]

Skills:

1. on the basis of the technical documentation and literature available to analyze and critically evaluate equipment and electrical and electronic components used in industry and vehicles - [K_U01++]
2. assemble, run and diagnose basic devices and operating systems in vehicles, independently carry out the necessary tests and report the results of experiments carried out - [K_U03++]

Social competencies:

1. creative approach to solving problems and issues related to the electrical and electronic systems in motor vehicles - [K_K01+]

Assessment methods of study outcomes

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Lecture:

- assess the knowledge and skills demonstrated during the completion of a problematic, realized in the form of written or oral.

Laboratory:

- assessment of knowledge and skills related to the implementation of laboratory exercises,
- checking and favoring knowledge and skills presented in the course of activities.

Get extra points for the activity in the classroom, and in particular for:

- making attempts to solve the problems posed in class,
- ability to work as a team.

Course description

Construction and functional properties of combustion engines ignition (Diesel). Technical solutions diesel engine control systems: line pumps, distributor pumps: axial and radial pump-chips (UIS), injection systems UPS and Common Rail (CR). Electrical and electronic systems, computerized vehicle accessories: active safety systems and passive navigation systems to improve ride comfort, etc. - functional properties, performance, technology and methods of diagnosis of individual systems and their components. Transmitters on the size of non-electrical quantities electrical systems used in the automotive (sensors: acceleration, linear and angular position, speed, engine load, force, vibration, angular displacement gyro sensors, etc.) - the construction, operation, specifications and methods of diagnosis.

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. Herner A., Riehl H. J.: Elektrotechnika i elektronika w pojazdach samochodowych, WKiŁ, Warszawa 2003.
2. Praca zbiorowa: Sterowanie silników o zapłonie samoczynnym. Informator techniczny BOSCH, WKiŁ, Warszawa 2004.
3. Praca zbiorowa: Układ wtryskowy Common Rail. Informator techniczny BOSCH, WKiŁ, Warszawa 2005.
4. Praca zbiorowa: Promieniowe rozdzielaczowe pompy wtryskowe VR. Informator techniczny BOSCH, WKiŁ, Warszawa 2001.
5. Praca zbiorowa: Mikroelektronika w pojazdach. Informator techniczny BOSCH, WKiŁ, Warszawa 2002.
6. Praca zbiorowa: Układy bezpieczeństwa i komfortu jazdy. Informator techniczny BOSCH, WKiŁ, Warszawa 2003.

Additional bibliography:

1. Denton T.: Automobile electrical and electronic systems, Arnold, London 2000.
2. Gunther H.: Dieseldiagnose, Vogel Verlag, Würzburg 2001.
3. Rokosch U.: Airbag und gurtstraffer, Vogel Industrie Medien, Würzburg 2002.
4. Janiszewski T., Mavrantzas S.: Elektroniczne układy wtryskowe silników wysokoprężnych, WKiŁ, Warszawa 2001.
5. Bednarek K., Bałchanowski T., Aspekty dydaktyczne oraz techniczne projektu i budowy stanowiska do badań samochodowych układów zapłonowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 82, Poznań 2015, s. 243-252.
6. Bednarek K., Bugała A., Własności użytkowe akumulatorów kwasowo-ołowiowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 47-60.

Result of average student's workload

Activity	Time (working hours)
1. participation in class lectures	9
2. participation in laboratory classes	9
3. participate in the consultations on the lecture	4
4. participate in the consultations on the lab	4
5. preparation for lecture classes	6
6. preparation laboratory	8
7. study reports	10
8. preparing to pass	12
9. involved in completing	4

Student’s workload

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Source of workload	hours	ECTS
Total workload	66	2
Contact hours	30	1
Practical activities	27	1

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