

(faculty stamp)

COURSE DESCRIPTION

Z1-PU7

WYDANIE N1

Strona 1 z 2

1. Course title: AUTOMOTIVE ELECTRONICS		2. Course code AE		
3. Validity of course description: 2012/2013				
4. Level of studies: BSc programme				
5. Mode of studies: intramural studies				
6. Field of study: MACROCOURSE ON AUTOMATIC CONTROL AND ROBOTICS, ELECTRONICS AND TELECOMMUNICATION AND COMPUTER SCIENCE			(FACULTY SYMBOL) RAU	
7. Profile of studies: general academic				
8. Programme: Electronics and Telecommunication				
9. Semester: 6				
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science				
11. Course instructor: dr hab. inż. Zdzisław Filus, prof. Pol. Śl.				
12. Course classification: other				
13. Course status: elective				
14. Language of instruction: English				
15. Pre-requisite qualifications: It is assumed that the course attendants know physical principles of operation of the internal combustion engine and have basic knowledge of circuit theory, electronic circuits, measurements and fundamentals of control and regulation.				
16. Course objectives: The objective of the lecture is to introduce the most important applications of electronic circuits to passenger vehicles. Particular attention is given to measurement of various physical quantities, connected with the movement of the car or with the operation of its individual blocks and to multiplexed wiring systems (automotive buses). Principles of control over various functions of the car are also discussed. The lecture should enable the students to understand peculiar features of the operation of electronic circuits in measurement systems, especially those designed for mechanical quantities, and in systems for control of mechanic and electric actuators.				
17. Description of learning outcomes:				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	He/She knows the principles of operation, the available parameters and ranges of use of electronic sensors that are designed for measurement of various physical quantities in road vehicles	written test	lecture	
2.	He/She knows the basic types of networks for transmission of data and control signals in road vehicles and their basic properties	written test	lecture	
3.	He/She knows the basics of control over the internal combustion engine and other systems of the vehicle	written test	lecture	
4.	He/She has basic knowledge of the present state of automotive electronics and the most important development trends	written test	lecture	
5.				
6.				

18. Teaching modes and hours**Lecture**

30 h

19. Syllabus description:

Introduction. First applications of electronic circuits to passenger vehicles. Current trends in automotive electronics: environmental protection, safety, ergonomics, social infrastructure.

Measurement transducers in cars. Pressure, linear and angular position, flow rate, temperature, linear and angular velocity, acceleration, engine torque sensors. Exhaust gas sensors (λ sensors). Engine knock sensors.

Vehicle electrical systems. Introduction. Electrical connections. Multiplexed wiring systems. CAN (Controller Area Network). Conventional electrical supply systems.

Microprocessor control systems in cars. Description of main electronically controlled vehicle systems. Basic features of microcontrollers for automotive applications.

Engine control systems. Combustion process in SI (spark ignition) engines. Strategies for reduction of harmful emissions. Ignition systems. Fuel delivery systems.

Anti-lock braking systems (ABS) and Traction control systems (TCS). Principle of operation of ABS systems. Typical configuration of ABS systems. Principle of operation of TCS systems.

Electronically controlled transmission. Semi-automatic and automatic transmissions - principle of operation. Electronically controlled continuously variable transmissions (CVS).

Suspension and steering control. Electronically controlled suspension. Steering-wheel assist. Four-wheel steering systems.

Electronic switches for automotive applications. Configurations of power MOSFET switches for resistive and inductive loads. Protection circuits.

Body electronic systems. Instrument panel. Vehicle condition monitoring. Airbags. Air conditioning.

20. Examination: no**21. Primary sources:**

Jurgen J.: Automotive Electronics Handbook. McGraw-Hill, Inc., 1999

Chowanietz E.: Automobile Electronics. Newnes (Butterworth-Heinemann Ltd), Oxford, 1995

22. Secondary sources:

Ocioszyński J.: Zespoły elektryczne i elektroniczne w samochodach. WNT Warszawa, 1999

Gajek A., Juda Z.: Mechatronika samochodowa. Czujniki. WKiŁ, Warszawa 2009

Zimmermann W., Schmidgall R.: Magistrale danych w pojazdach. Protokoły i standardy. WKiŁ, Warszawa 2008

Herner A., Riehl H.-J.: Elektrotechnika i elektronika w pojazdach samochodowych. WKiŁ, Warszawa 2010

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/20
2	Classes	/
3	Laboratory	/
4	Project	/
5	BA/ MA Seminar	/
6	Other	5/5
	Total number of hours	35/25

24. Total hours: 60**25. Number of ECTS credits:** 2**26. Number of ECTS credits allocated for contact hours:** 2**27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):****26. Comments:**

Approved:

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(date, Instructor's signature).....
(date, the Director of the Faculty Unit signature)