POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Experimental vehicle testing [S2MiBP1-PS>EBP]

Course

Field of study	Year/Semester
Mechanical and Automotive Engineering	1/2

Area of study (specialization)	Profile of study
Motor Vehicles	general academic

Level of study	Course offered in
second-cycle	Polish

Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other
15	15	0

Tutorials	Projects/seminars	
0	0	

Number of credit points

2,00

Coordinators	Lecturers
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Prerequisites

Knowledge: The student has academic level knowledge in area of vehicle dynamics, vehicle structure and subsystem design and functioning, metrology and numerical computation methods Skills: The student is able to use computer, spreadsheets application and do basic programming. Is able to use the languages: native and international (English) at a level sufficient to enable understanding of technical texts. Is able to use literature, Internet and software tools for solving basic problems concerning use of science-technical computing software. Social competencies: Understands the need and knows the possibilities of lifelong learning. Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions.

Course objective

To make students familiar with knowledge allowing to master methods of testing and measuring vehicle dynamics, in particular vehicle prototypes, analysis of obtained data with relation to applicable standards (in particular ISO standards). Indication of importance of experimental vehicle testing as a verification method of simulation models and as a source of new knowledge.

Course-related learning outcomes

Knowledge:
Has extended knowledge in the field of computer science, concerning computer programming and engineering calculation programs in the field of computer simulation of physical systems.
Has a general knowledge of the types of research and methods of testing working machines with the use of modern measurement techniques and data acquisition.
Has extended knowledge of the standards for working machines in the field of methods of calculating and testing machines, safety, including road safety, environmental protection as well as mechanical and electrical interface.

Skills:
Can formulate and test hypotheses related to simple research problems.
Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.
Is able to carry out basic measurements of mechanical quantities on the tested working machine with the use of modern measuring systems.

Social competences:
He is ready to critically assess his knowledge and received content.
Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.
It is ready to fulfill social obligations, inspire and organize activities for the benefit of the social environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Written test, which is based on answers related to the selection of given answers and open questions.
Credits will be given after achieving at least 50% of points. Answers are scored from 0 to 1 point.

Programme content

Basic concepts and definitions, experiments planning, measurement uncertainty. Types of measured signals used in vehicle experimental testing. Sensors and acquiring and recording equipment used in measurements and tests of motor vehicles. Time domain analysis of signals form vehicle experimental testing. Methods and software. Frequency domain analysis of signals form vehicle experimental testing. Methods and software. Methods of experimental testing vehicle and its subsystems. Public road tests, test during vehicle operation. Experimental tests on proving grounds. Tests of vehicle dynamic performance. Tests of vehicle maneuverability and stability. Sensors, methodology of testing and data processing. Standards. Tests of vehicle suspensions, ride comfort and safety. Sensors, methodology of testing and data processing. Standards. Tests of road vehicle noise emission. Sensors, methodology of testing and data processing. Standards. Laboratory testing of vehicles - static and quasi-static tests. Vehicle testing with use of test benches (electrohydraulic vibration excitators). Passive safety tests. Methodology of tests, equipment, test stands, standards and other regulations. Test stand tests of vehicle subsystems and components. Testing of engines, driveline components, brakes, suspensions, steering systems, wheels and tires.Method of Remote Parameter Control. Road vehicles and its components homologation (type approval, certificate of conformity) issues.

Course topics

Teaching methods

1. Lecture with a multimedia presentation - a combination of an information and problem lecture;
2. Laboratory exercises with the use of Matlab / Simulink systems, dSpace and laboratory stations as well as equipment for data recording and sensors

Bibliography

Basic

1. Orzełowski S.: Eksperymentalne badania samochodów i ich zespołów, WNT Warszawa, 1995
2. Sitek K., Syta S.: Badania stanowiskowe i diagnostyka, WKŁ, Warszawa, 2011
Additional
1. Czajka J.H. : Pomiary drgań i hałasu na stanowiskach pracy w transporcie, OWPW, Warszawa 2000
2. P. Drozdowski: Wprowadzenie do Matlaba, Wydawnictwo PK, Kraków, 1995
3. Segers J.: Analysis Techniques for Racecar Data Acquisition, SAE International, 2008
4. Osiecki J., Gromadowski T., Stępiński B.: Badania pojazdów samochodowych i ich zespołów na symulacyjnych stanowiskach badawczych, WITE, Radom 2006
5. Kilar H.: Homologacja pojazdów samochodowych, WUPS, Szczecin 2005
6. Zakrzewski J. Czujniki i przetworniki pomiarowe, WPŚ, Gliwice 2004
7. Zalewski, R. Cegieła: Matlab - obliczenia numeryczne i ich zastosowanie, Wydawnictwo Wakom, Poznań, 1996

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00