COURSE DESCRIPTION CARD - SYLLABUS

Course name
Designing road vehicle subassemblies

Course

Field of study
Construction and Exploitation of Means of Transport
Year/Semester
3 / 6
Area of study (specialization)
Motor vehicles
Profile of study
general academic
Level of study
First-cycle studies
Course offered in
polish
Form of study
part-time
Requirements
compulsory

Number of hours

Lecture
18
Laboratory classes
18
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
dr inż. Marek Maciejewski

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of technical drawing, machine construction, car construction and car mechanics. Knowledge of the basic principles of carrying out strength and fatigue analyzes. Understanding the basic principles of design. Ability to adapt the calculation process to the task performed, the selection and use of dependencies in the field of traction calculations, geometric structures, strength and fatigue. Spreadsheet support. Determining the hierarchy and schedule of tasks when designing typical mechanical structures. The ability to identify problems and solve computational and construction dilemmas. Independence.

Course objective

Provide students with basic information on the design of vehicle systems and components, in particular the methods of designing mechanical car drive systems and their components.

Course-related learning outcomes

Knowledge

1. Knows methods of selecting and configuring drive systems according to the type, size and tasks of the vehicle. 2. Has knowledge of the design of subassemblies and elements of drive transmission systems in motor vehicles. 3. Knows the rules and algorithms of strength calculation and selection of materials for

elements of drive systems. 4. Knows the rules of determining kinematic and dynamic parameters of vehicle systems and components.

Skills

1. Can design subassemblies and elements of a vehicle that meet the appropriate geometric, strength, durability and functional requirements. 2. He can choose standardized elements. 3. Can choose construction materials of elements, properties of their top layers, fits of cooperating elements. 4. If there are alternative solutions, he can choose the optimal solution.

Social competences

1. Can independently define priorities in the design of the drive system and other car systems and mechanisms. 2. Can cooperate with other people who are simultaneously designing other car systems. 3. Understands the need to use solutions ensuring traffic safety and environmental protection.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam on the lecture material, completion of laboratory classes based on the documentation of the tasks performed.

Programme content

The specificity of drive systems of passenger cars, delivery vans and trucks. Classification of design solutions for drive systems in passenger cars. Design of disc clutches - calculation algorithms for: geometry of the clutch disc, durability of the friction clutch and clutch springs - central and screw. Types of mechanical gearboxes. Choice of basic parameters: axis distance, rolling diameter and toothed wheel width, number of teeth, tooth line angle and profile angle, axis distance change indicator, normal modulus, tooth head height and tooth modifications. Outline displacement factors and axis distance. Diameter of cylindrical wheels. Workmanship accuracy classes. Materials. Thermal treatment. Strength of gears in car drive systems. Safety factors. Tooth strength check: for fatigue bending at the base of the tooth and for pitting on the pitch diameter. Ways of taking into account variable loads. Synchronizers: synchronizing torque, synchronizing and heat loads. Calculation of synchronizers with locking with a toothed rim and selection of inertial Porsche type ring synchronizers. Determination of the fatigue life of rolling bearings in gearboxes. Interdental forces: circumferential, radial and axial as the basis for calculating the average equivalent loads of bearings: transverse and longitudinal. Bearing selection: comparison of the nominal life with the required life. Calculations related to the selection of torque converters. Selection of geometrical parameters of cylindrical planetary gears: axis distances, gear diameters and widths, tooth profile angles and normal modules. Calculations of main, bevel and hypoid gears in driving axles. Selection of basic parameters for wheels in the differential gear. Durability of rolling bearings of the main transmission. Drive shafts: calculation loads and strength calculations of driveshafts.

Teaching methods

1. Lecture: multimedia presentation. 2. Laboratory classes: preliminary design development of vehicle subsystems, strength and durability calculations and modification of previously adopted subsystems.

Bibliography

Basic

1. Jaśkiewicz Zb., Projektowanie układów napędowych pojazdów samochodowych, WKiŁ, Warszawa, 1982

2. Jaśkiewicz Zb., Wąsiewski A., Układy napędowe pojazdów samochodowych: obliczenia projektowe, OWPW, Warszawa, 2002

3. Poradnik inżyniera samochodowego (red. Jaśkiewicz Zb.), WKiŁ, 1990

Additional

1. Stańczyk T.L., Lomako D., Komputerowe obliczenia zespołów samochodów i ciągników, WPŚ, Kielce, 2004

2. Zając M., Układy przeniesienia napędu samochodów ciężarowych i autobusów, WKiŁ 2008

3. Micknass W., Popiol R., Sprenger A., Sprzęgła, skrzynki biegów, wały i półosie napędowe, WKiŁ 2012

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate