



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vehicle powertrain construction

### Course

Field of study

Year/Semester

Construction and Exploitation of Means of Transport

3/6

Area of study (specialization)

Profile of study

Motor vehicles

general academic

Level of study

Course offered in

First-cycle studies

Polish

Form of study

Requirements

part-time

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

18

9

0

Tutorials

Projects/seminars

0

0

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

dr inż. Hubert Pikosz

email: [hubert.pikosz@put.poznan.pl](mailto:hubert.pikosz@put.poznan.pl)

tel. 61 665 2880

Faculty of Civil and Transport Engineering

ul. Piotrowo 3 60-965 Poznań

### Prerequisites

The student has a basic knowledge of machine science, mechanics, the basics of machine construction and the laws of physics.

The student is able to integrate the obtained information, interpret it, draw conclusions, read diagrams and technical drawings.

The student is aware of the role of means of transport in human economic activity.

### Course objective

Providing students with information on the construction and operation of assemblies and mechanisms of the vehicle powertrain.



### Course-related learning outcomes

#### Knowledge

The student knows the tasks, structure and properties of various types of basic vehicle systems.

The student knows the range of applications of particular varieties of basic vehicle systems.

The student knows the influence of individual systems on the road safety of a motor vehicle.

#### Skills

He can interpret the phenomena accompanying the movement of the car in terms of its physical foundations and limitations.

The student can describe the tasks, principles of operation, design and functional variations, properties and the scope of applications of various solutions of mechanisms and assemblies of the main vehicle systems.

#### Social competences

The student knows the impact of vehicles on the efficiency of human operation and the environment.

The student is able to independently develop his knowledge of the construction and properties of vehicles and their components.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by a written exam.

Mandatory individual reports on laboratory activities. Final credit of laboratory classes.

### Programme content

Drive train. Driving sources of motor vehicles and their characteristics. Types of drive transmission systems.

Automotive clutches. Tasks and types of clutches. Single-disc dry friction clutches, double multi-disc clutches, multi-disc wet clutches. Clutch friction plate. Mechanism of friction lining wear compensation. Dual mass flywheel. Clutch control mechanisms: mechanical, hydraulic, electromechanical. Torsional vibration damping by the clutch.

Gearboxes. Tasks, types and principle of operation of gearboxes.

Mechanical stepped gearboxes with fixed axles used in passenger cars. Coaxial and misaligned gearboxes. Synchronizing mechanisms. Gear shifting mechanisms. Automated passenger car gearboxes.

Fixed-axle mechanical stepped gearboxes used in trucks. Gear spanning unit and gear range changing unit in truck gearboxes. Gear shifting control systems in heavy goods vehicles.

Mechanical stepped automatic gearboxes with fixed axles. Double clutch and gearshift control systems for dual clutch transmissions.



Hydromechanical stepped automatic gearboxes with rotating axles. Torque converter, torque converter and lock-up clutch. Planetary team and planetary ranks. Hydraulic and electro-hydraulic control systems of automatic transmissions.

Mechanical continuously variable automatic gearboxes. The principle of operation of the continuously variable transmission. Stepless shifting control. Belt and chain elements transmitting torque in continuously variable transmissions used in passenger cars.

Drive shafts, flexible joints and straight joints of drive shafts. Construction and tasks of drive shafts and joints.

Main gears. Construction and tasks of the main gear. Helical and bevel main gears.

Differentials. Construction and tasks of the differential gear. Conical and cylindrical differentials. Differentials with increased internal friction. Active differential mechanisms.

Drive shafts and constant velocity joints. Tasks, structure and loading of drive shafts. Double-cross, ball and three-arm joints. Compensation of length changes and dampers of the driveshaft vibration.

Wheel hubs of passenger cars and trucks.

Drive on more than one axle. All-wheel drive in passenger cars. Interaxial differentials, differential locking units. Control of torque distribution to the front and rear axle of the car. Drive on more than one axle on trucks. Distribution boxes in trucks.

### Teaching methods

Lecture with multimedia presentation.

Laboratory classes: independent performance of tasks given by the teacher - practical exercises.

### Bibliography

Basic

Prochowski L.: Mechanika ruchu. WKŁ, W-wa, 2005

Jackowski J., Łęgiewicz J., Wieczorek M.: Samochody osobowe i pochodne. WKŁ, W-wa, 2011

Prochowski L., Żuchowski A.: Samochody ciężarowe i autobusy. WKŁ, W-wa, 2004

Micknass W., Popiol R., Sprenger A.: Sprzędła skrzynki biegów wały i półosie napędowe. WKŁ, W-wa, 2005

Zajac M.: Układy przeniesienia napędu samochodów ciężarowych i autobusów. WKŁ, W-wa, 2003

Gabryelewicz M.: Podwozia i nadwozia pojazdów samochodowych cz. 1 Podstawy teorii ruchu i eksploatacji oraz układ przeniesienia napędu. WKŁ, W-wa, 2018



Additional

Meywerk M.: Vehicle dynamics. John Wiley & Sons Ltd, Chichester, 2015

### Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	27	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for exam) <sup>1</sup>	33	1,0

<sup>1</sup> delete or add other activities as appropriate