



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Railway vehicles

### Course

Field of study

Year/Semester

Transport

3/6

Area of study (specialization)

Profile of study

Ecology of Transport

general academic

Level of study

Course offered in

First-cycle studies

polski

Form of study

Requirements

full-time

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

15

0

Tutorials

Projects/seminars

0

0

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Wydział Inżynierii Lądowej i Transportu

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ul. Piotrowo 3, 60-965 Poznań

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### Prerequisites

The student has a basic knowledge of the means of transport.

The student is able to use the acquired knowledge to analyze specific phenomena and processes occurring in the movement of objects.

The student is able to solve specific problems appearing in technical systems.

The student is able to determine the priorities important in solving the tasks set before him.

The student shows independence in solving problems, gaining and improving the acquired knowledge and skills.



## Course objective

The aim of the course is to familiarize students with the construction and partly operation of rail vehicles. Students acquire general knowledge and skills in the field of types of rail vehicles and their construction and construction of rail vehicle assemblies.

## Course-related learning outcomes

### Knowledge

1. has extended and in-depth knowledge of mathematics useful for formulating and solving complex technical tasks concerning various means of transport
2. has a structured and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues in this discipline of transport engineering
3. has knowledge of ethical codes regarding transport engineering, is aware of the threats related to environmental protection and understands the specificity of mission-critical systems

### Skills

1. can, when formulating and solving tasks in the field of transport, apply appropriately selected methods, including analytical, simulation or experimental methods
2. is able to design elements of means of transport with the use of data on environmental protection

### Social competences

1. can think and act in an entrepreneurial way, incl. finding commercial applications for the created system, bearing in mind not only the business benefits, but also the social benefits of the conducted activity
2. correctly identifies and resolves dilemmas related to the profession of a transport engineer

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment of the way the written master's thesis is presented in the forum of the dean's group.  
Assessment of the written work in terms of content, methodology and editorial content.

## Programme content

Historical development of vehicles, types of trains and rail vehicles. Vehicle construction standards organizations. Breakdown of rail vehicles. Types of traction, types of currents in electric traction. Track widths and geometry.

Geometry and wheel guidance on the track, stability of rail vehicles. Individual wheels.

Safety, running quality, gauge, comfort and noise standards and their impact on vehicle structure.

Vehicle bodies: skeleton, cradle (frame), plating. Structural aluminum, non-metallic elements. Loads acting on the vehicle and vehicle durability, passive safety.



Types of chassis for rail vehicles. Railroad carriages, their tasks. Unusual chassis solutions. General overview of the undercarriage elements: wheels, wheelsets, bearings, wheel sets guidance, suspension springs, damping elements, air suspension, hanger suspension, elements of longitudinal and transverse forces transfer from the body, inter-car coupling. The use of rubber and plastics in chassis components.

Inter-car couplings: non-automatic and automatic, types of standard couplings and couplings from various manufacturers. Construction of inter-car buffers, the problem of longitudinal forces in the train and car timing.

Division of locomotives, general construction of diesel and electric locomotives. Locomotive bodies, driver's cabins. Types and construction of diesel engines of locomotives. Types and structure of drive gears, structure of drive transmission systems, paraxial gears. Electric locomotive drive system and electric drive transmission of diesel locomotive: types of currents and controls, main generators, types and construction of traction motors.

Electric traction vehicle control, traction characteristics of locomotives.

Overview of examples of locomotives.

Rail vehicle and train computer networks.

Railway brakes: types and their brief description. Air brake operation.

Overview of the construction of steam locomotives: their types, principle of operation, boiler layout, timing.

Construction of passenger carriages, elements of passenger car equipment, wagons with a tilting body.

Freight wagons: types, construction, type of self-unloading wagons.

Fast train, traction units, suburban vehicles, rail buses

Trams: types, construction. Overview of contemporary design solutions.

### Teaching methods

case study / discussion / problem solving

### Bibliography

Basic

1. W. Gąsowski, M. Sobczak: Układy biegowe wagonów kolejowych. Wyd P.P. Poznań 1987
2. W. Gąsowski: Wagony kolejowe, konstrukcja i badania. WKŁ, Warszawa 1988
3. W. Gąsowski, Z. Durzyński, Z. Marciniak: Elektryczne pojazdy trakcyjne. Wyd. Ucz. P.P., Poznań 1995
4. Gąsowski W., Sobaś M. Nowoczesna skrajnia pojazdów szynowych. IPS Poznan 2005



5. J. Gronowicz, B. Kasprzak: Lokomotywy spalinowe. WKŁ, Warszawa 1989
6. J. Madej (red): Technika taboru drogowo-szynowego (bimodalnego). Inst. Pojazdów Szynowych Poznań 2000
7. J. Madej: Teoria ruchu pojazdów szynowych. Of. Wyd. Pol. War. Warszawa 2004
8. Piec P. Badania eksploatacyjne elementów i zespół pojazdów szynowych. Kraków 2004
9. Romaniszyn Z.: Podwozia wózkowe pojazdów szynowych. Wyd. Pol. krakowskiej, 2005
10. T. Piechowiak: Hamulce pojazdów szynowych. Wydawnictwo Politechniki Poznańskiej. Poznań 2012

Additional

1. Professional magazines: Technika Transportu Szynowego, Pojazdy Szynowe

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	15	0,5

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