COURSE DESCRIPTION CARD - SYLLABUS

Course name
Braking systems [N2Trans1-TrSz>SH]

Course

Field of study
Transport

Year/Semester
1/1

Area of study (specialization)
Railway Transport

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
18

Laboratory classes
0

Other
0

Tutorials
9

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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dr hab. inż. Wojciech Sawczuk prof. PP
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Prerequisites

KKNOWLEDGE: the student has a basic knowledge of railway braking systems. In addition, he knows the construction and the operating characteristics of the main braking devices and the principle of automatic operation railway brake SKILLS: the student is able to use the acquired knowledge to calculate the brakes and then to designing the car brake system SOCIAL COMPETENCES: the student is able to cooperate in a group, organize a repair process and production in its main outline. The student is able to determine the priorities important in solving the tasks set before him

Course objective

The aim of the course is to learn the practical principles of braking trains and equipment operation implementing this process and operational recommendations. Moreover, learning about the principles of conducting research station and training ground railway brakes.

Course-related learning outcomes

Knowledge:
Student has advanced detailed knowledge of selected issues in the field of transport engineering
Student has knowledge about development trends and the most important new achievements of means of transport and other, selected, related scientific disciplines

Skills:
Student is able to plan and conduct experiments, including measurements and simulations, interpret the obtained results and draw conclusions as well as formulate and verify hypotheses related to complex engineering problems and simple research problems
Student is able - in accordance with a given specification, taking into account non-technical aspects - to design a complex device, system in the field of transport engineering or a process and to implement this project - at least in part - using appropriate methods, techniques and tools, including adapting the existing or developing new ones tools

Social competences:
Student understands that knowledge and skills become obsolete very quickly in the field of transport engineering
Student understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
For discussion, ongoing preparation and activity in class. Written exam for lectures and written exam for classes.

Programme content

Requirements for modern railway brakes, definitions and concepts of braking, braking systems of rail vehicles, including PN, EP, ED, R, Mg, their scope of application, advantages and disadvantages, operational recommendations, experimental methods of determining the braking weight of wagons, characteristics of pneumatic devices and friction - wear materials for brake pads and disc brake linings, test stands and test programs, rules and standards for assembling trains.

Course topics

Requirements, definitions and fundamental concepts relating to railway brakes. Pneumatic, electropneumatic, electrodynamic, rail and magnetic braking systems—their applications, advantages and disadvantages. Determination of wagon braked weight and characteristics of pneumatic equipment and friction materials. Test stands, testing programmes and train formation rules.

Teaching methods

1. Lecture with multimedia presentation,
2. Exercises - solving problems.

Bibliography

Basic
1. Piechowiak T., Hamulce pojazdów szynowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2012.
2. Ścieszka S.F., Hamulce cierne. Zagadnienia materiałowe, konstrukcyjne i tribologiczne, Wydawnictwo Gliwice-Radom 1998.
3. Przybyszewski M., Elektryczne zespoły trakcyjne. Wydawnictwo WKŁ, Warszawa 2017.
Additional
1. Grzesikiewicz W.: Hamulce pojazdów szynowych. Wydawnictwo Politechniki Warszawskiej (skrypt), Warszawa 1982.
2. Kalinowski A., Orlik A.: Wagony towarowe i hamulce. WKŁ, Warszawa 1981.
3. Miatluk M., Kamiński Z., Układy hamulcowe pojazdów obliczenia. Wydawnictwo Politechniki Białostockiej, Białystok 2005.
4. Janiak M., Kalinowski A.: Konstrukcja i eksploatacja wagonów kolejowych. WŁK, Warszawa, 1980.

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	27	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00