STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Braking Systems		**1010612311010620554**

Field of study	Profile of study (general academic, practical)	Year /Semester
Transport	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Railway Transport	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **2**	Classes: **1**	Laboratory: **-**	Project/seminars: **-**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

EngD Wojciech Sawczuk
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Piotrowo 3 Street, 60-965 Poznan

Responsible for subject / lecturer:

M.Eng Mateusz Jüngst
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tel. 61 665 2023
of Transport Engineering
Piotrowo 3 Street, 60-965 Poznan

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student has a basic knowledge of railway braking systems. In addition, it knows the construction and characteristics of the operation of the main braking devices and the principle of operation of the automatic rail brake.
2	**Skills**	The student can use the acquired knowledge to calculate the brakes and then to design the wagon braking system.
3	**Social competencies**	The student is able to cooperate in a group, organize the repair and production process in its main outlines. The student can determine the priorities important in solving the tasks set before him.

Assumptions and objectives of the course:

The aim of the course is to familiarize with the practical rules of braking trains and the work of devices implementing this process and operating recommendations. In addition, learning about the principles of conducting bench tests and rail polygons.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. has advanced and in-depth knowledge in the field of transport engineering, theoretical foundations, tools and means used to solve simple engineering problems - [T2A_W01]
2. has advanced detailed knowledge of selected issues in the field of transport engineering - [T2A_W03]
3. has knowledge about development trends and the most important new achievements of means of transport and other, selected, related scientific disciplines - [T2A_W04]

Skills:

1. can acquire information from literature, databases and other sources (in Polish and English), integrate them, make their interpretation and critical evaluation, draw conclusions and formulate and fully justify opinions - [T2A_U01]
2. is able to use information and communication techniques used in the implementation of transport projects - [T2A_U02]
3. can plan and carry out experiments, including measurements and simulations, interpret the results obtained and draw conclusions and formulate and verify hypotheses related to complex engineering problems and simple research problems - [T2A_U03]

Social competencies:

1. Understands that in the field of transport engineering, knowledge and skills quickly become obsolete - [T2A_K01]
2. understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems - [T2A_K02]

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Assessment methods of study outcomes

Written exam, final test

Course description

requirements for modern railway brakes, definitions of brake concepts, braking systems for railway vehicles, scope of their application, advantages and disadvantages, operating recommendations, experimental methods of determining the braking mass of wagons, characteristics of pneumatic devices and friction - wear materials for brake pads and disk brake pads, stands research and testing programs, rules and standards for train compilation

Basic bibliography:

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. Grzesikiewicz W.: Hamulce pojazdów szynowych. Wydawnictwo Politechniki Warszawskiej (skrypt), Warszawa 1982

Additional bibliography:

1. Kalinowski A., Orlik A.: Wagony towarowe i hamulce. WKŁ, Warszawa 1981
2. UIC regulations and PN EN standards and TSI

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the lecture	5
2. Participation in the lecture	30
3. Strengthening the content of the lecture	5
4. Consultations for the lecture	2
5. Preparation for the exam	8
6. Participation in the exam	2
7. Preparation for exercises	5
8. Participation in exercises	15
9. Strengthening the content of exercises	5
10. Consultations for exercises	2
11. Preparation for passing	4
12. Participation in the credit	2

Student's workload

Source of workload	hours	ECTS
Total workload	85	3
Contact hours	53	2
Practical activities	0	0

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