



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vibration and noise in rail transport

### Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Railway Vehicles

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Faculty of Civil and Transport Engineering

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### Prerequisites

**KNOWLEDGE:** The student has a basic knowledge of the impact of means of transport on the environment. He is able to plan, carry out a simple measurement of noise and vibration and interpret the obtained test results.

**SKILLS:** The student is able to use the acquired knowledge to solve simple problems related to determining the impact of transport on the environment. Can determine the effects of rail transport on the environment and humans.

**SOCIAL COMPETENCES:** The student is able to cooperate in a group taking different roles in it, shows independence in solving problems, acquiring and improving the acquired knowledge and skills, and is



aware of the importance and understands the non-technical aspects and effects of transport on the environment.

### Course objective

The aim of the course is to familiarize students with theoretical and practical issues related to the generation, propagation and impact on humans of noise and vibrations occurring in rail means of transport and related infrastructure. Students will gain practical knowledge in the use of specialized measuring equipment for recording vibroacoustic signals, methods of measuring and assessing noise and vibrations in rail means of transport, in the environment and their impact on humans.

### Course-related learning outcomes

#### Knowledge

Has knowledge of the principles of safety and ergonomics in the design and operation of machines and the threats that machines pose to the environment.

Has general knowledge in the field of standardization, EU recommendations and directives, national, industry and international standards systems and industrial standards.

Has extensive knowledge of selected departments of technical mechanics related to the selected specialty.

#### Skills

He can estimate the potential threats to the environment and people from the designed work machine and vehicle from a selected group.

Can plan and carry out experimental research of specific processes taking place in machines and routine research of a working machine or a vehicle from a selected group.

He can advise on the selection of machines for the technological line as part of the specialization.

#### Social competences

Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in the event of difficulties in solving problems on their own.

It is ready to fulfill social obligations, inspire and organize activities for the benefit of the social environment.

It is ready to initiate actions for the public interest.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam, final test, reports on laboratory exercises

### Programme content

Trends in the development of rail transport in Poland and analysis of the impact of rail transport on the environment. Introduction to acoustics and the theory of mechanical vibrations, identification of the



main sources of noise and vibrations occurring in rail means of transport, the impact of noise and vibrations on the environment and humans and criteria for their assessment, review of the applicable regulations on the impact of noise and vibrations in rail means of transport and in the environment, measurement methods, analysis of vibroacoustic signals and methods of inference relating to issues related to the occurrence of noise and vibrations in rail transport and in the environment, methods of noise and vibration reduction in transport. Ways of protecting people and the environment against noise and vibrations occurring in rail transport.

### Teaching methods

1. lecture with multimedia presentation
2. calculating exercises and carrying out research reports

### Bibliography

#### Basic

1. Makarewicz R.: Hałas w środowisku. Ośrodek Wydawnictw Naukowych, Poznań 1996.
2. Thompson D.: Railway Noise and Vibration - Mechanisms, Modelling and Means of Control. Publisher Elsevier 2009. Pełnotekstowe Książki w wersji elektronicznej dostępne przez Bibliotekę Politechniki Poznańskiej (Knovel Library).
3. Nader M.: Modelowanie i symulacja oddziaływania drgań pojazdów na organizm człowieka. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001.
4. Makarewicz R.: Wstęp do akustyki teoretycznej cz. 1. Wydawnictwo Naukowe UAM, Poznań 2005.
5. Fastl H., Zwicker E., Psycho-Acoustics. Facts and Models. Springer 2007.
6. Normy i rozporządzenia dotyczące oddziaływania hałasu i drgań w transporcie szynowym.

#### Additional

1. Engel Z., Ochrona środowiska przed drganiami i hałasem. Wyd. PWN 2001.
2. Cempel Cz., Wibroakustyka stosowana. Wydawnictwo PWN, Warszawa 1989.
3. Everest F. A., Podręcznik akustyki. Wydawnictwo SONIA DRAGA sp. z o. o. Katowice 2004.
4. Moore B. C. J., Wprowadzenie do psychologii słyszenia. Wydawnictwo Naukowe PWN, Warszawa-Poznań 1999.
5. Makarewicz R., Wstęp do akustyki teoretycznej cz. 1. Wydawnictwo Naukowe UAM, Poznań 2005.
6. Makarewicz R., Podstawy teoretyczne akustyki urbanistycznej. Państwowe Wydawnictwo Naukowe, Warszawa – Poznań 1984.
7. Environmental noise materiały szkoleniowe firmy Brüel & Kjær.



8. Cempel C., Drgania mechaniczne Wydawnictwo Politechniki Poznańskiej 1984.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	20	1,0

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