



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vibration and Noise in Transportation

### Course

Field of study

Year/Semester

Transport

1/1

Area of study (specialization)

Profile of study

Low-emission transport

general academic

Level of study

Course offered in

Second-cycle studies

Polish

Form of study

Requirements

full-time

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

15

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

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Faculty of Civil and Transport Engineering

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### Prerequisites

**KNOWLEDGE:** The student has basic knowledge of mathematics in the field of elementary functions, differential calculus, integral calculus and elements of mathematical statistics and physics in the field of acoustics, moreover, has a basic knowledge of the impact of means of transport on the environment, with particular emphasis on issues related to vibroacoustics.

**SKILLS:** The student is able to plan, perform a simple measurement of noise and vibrations, interpret the obtained test results and draw appropriate conclusions, can determine the impact of vibroacoustic phenomena occurring in transport on the environment and humans.

**SOCIAL COMPETENCES:** The student is able to work 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 acquaint students with theoretical and practical issues related to the generation, propagation and impact on humans of noise and vibrations occurring in 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 means of transport, in the environment and their impact on humans.

### Course-related learning outcomes

#### Knowledge

The Student has advanced and in-depth knowledge of transport engineering, theoretical foundations, tools and means used to solve simple engineering problems,

The Student has advanced detailed knowledge on selected issues in the field of transport engineering

The Student knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

#### Skills

The Student is able to obtain information from literature, databases and other sources (in Polish and English), integrate them, interpret and critically evaluate them, draw conclusions and formulate and exhaustively justify opinions,

The Student is able to use information and communication techniques used in the implementation of projects in the field of transport,

The Student is able - when formulating and solving engineering tasks - to integrate knowledge from various areas of transport (and, if necessary, also knowledge from other scientific disciplines) and apply a systemic approach, also taking into account non-technical aspects,

The Student is able to make a critical analysis of existing technical solutions and propose their improvements (improvements)

#### Social competences

The Student understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems

The Student understands the importance of popularizing the latest achievements in the field of transport engineering,

The Student is aware of the need to develop professional achievements and to observe the rules of professional ethics.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:



For discussion, ongoing preparation and activity in class. Written credit. Mandatory individual reports on laboratory activities. Final credit of laboratory classes.

### Programme content

Introduction to acoustics and the theory of mechanical vibrations, identification of the main sources of noise and vibrations occurring in 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 means of transport and in the environment, measurement methods, analyzes of vibroacoustic signals and methods of inference relating to issues related to the occurrence of noise and vibrations in means of transport and in the environment, methods of noise and vibration reduction in transport. Methods of protecting people and the environment against noise and vibrations occurring during transport.

### Teaching methods

1. lecture with multimedia presentation
2. practical fieldwork and accounting classes

### Bibliography

#### Basic

1. Cempel C.: Wibroakustyka stosowana. PWN, Warszawa 1989.
2. Engel Z.: Ochrona środowiska przed drganiami i hałasem. Wydawnictwo Naukowe PWN, Warszawa 2001.
3. Makarewicz R.: Hałas w środowisku. Ośrodek Wydawnictw Naukowych, Poznań 1996.
4. Ciesielski R., Kawecki J., Maciąg E.: Ocena wpływu wibracji na budowle i ludzi w budynkach (diagnostyka dynamiczna). Instytut Techniki Budowlanej, Warszawa 1993.
5. Harrison M., Vehicle Refinement Controlling noise and vibration in road vehicles. SAE International 2004.
6. Thompson D., Railway noise and vibration. Mechanizm, Modelling and Means of Control. Elsevier 2009.

#### Additional

1. Makarewicz R.: Dźwięk w środowisku. Ośrodek Wydawnictw Naukowych, Poznań 1994.
2. Makarewicz R.: Wstęp do akustyki teoretycznej cz. 1. Wydawnictwo Naukowe UAM, Poznań 2005.
3. Zakrzewski T., Żuchowski R.: Kompendium akustyki architektonicznej wraz z przykładami metod obliczeniowych. Wydawnictwo Politechniki Śląskiej, Gliwice 2009.



4. Nader M.: Modelowanie i symulacja oddziaływania drgań pojazdów na organizm człowieka. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001.
5. Rogoziński R., Sadowski J.: Walka z hałasem w komunikacji i przemyśle. WKiŁ, Warszawa 1965.
6. Normy i rozporządzenia dotyczące hałasu i drgań.

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	70	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	25	1,0

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