



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vibration and Noise in Transportation [N2Trans1-TrN>WiHwT]

### Course

Field of study

Transport

Year/Semester

1/1

Area of study (specialization)

Low-emission 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

9

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

dr hab. inż. Małgorzata Orczyk prof. PP  
malgorzata.orczyk@put.poznan.pl

### Lecturers

### 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:

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

The course program covers the following topics:

1. Introduction to vibroacoustic issues.
2. Discussion of the impact of noise and mechanical vibrations on humans and the environment.
3. Indication of the main sources of noise and mechanical vibrations occurring in means of transport and the methods used to reduce their negative impact.

## Course topics

The lecture program covers the following topics:

1. Introduction to issues related to acoustics and mechanical vibrations.
2. The impact of sound and vibration on humans.
3. Assessment of noise and vibrations at transport-related workplaces.
4. Assessment of noise and vibration in the environment.
5. Sources of noise and vibrations in transport

6. Methods of measuring noise and vibrations in transport.
7. Methods of reducing noise and vibrations in transport
8. Review of selected measurement systems used to measure noise and vibrations.
9. Summary of classes

The laboratory program includes:

1. Introduction to laboratory classes.
2. Introduction to selected issues of the impact of noise and mechanical vibrations.
3. Assessment of noise nuisance affecting humans - frequency analysis.
4. Assessment of noise and vibrations at the workplace.
5. Assessment of traffic noise on the example of the Piotrowo Campus.
6. Assessment of tram noise in the pass-by test.
7. Assessment of vibrations generated by individual systems of a diesel locomotive.
8. Summary and end of classes.

### Teaching methods

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

### Bibliography

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.
7. Normy i rozporządzenie związane z oceną hałasu i drgań na stanowisku pracy.
8. Normy i rozporządzenia związane z oceną hałasu i drgań w środowisku.
9. Normy i rozporządzenia związane z oceną hałasu środków transportu.

Uzupełniająca

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. Everest F.A., Podręcznik akustyki. Wydawnictwo SONIA DRAGA sp. z o. o. Katowice 2004.
6. Griffin M.J., Handbook of human vibration. Wyd. Elsevier 2004

### Breakdown of average student's workload

	Hours	ECTS
Total workload	77	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)	50	2,00