



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vibration and noise in rail transport [S2MiBP1-PSz>DiHwTSz]

### Course

Field of study

Mechanical and Automotive Engineering

Year/Semester

2/3

Area of study (specialization)

Railway Vehicles

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

dr hab. inż. Małgorzata Orczyk prof. PP  
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### Lecturers

### 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:

Learning outcomes presented above are verified as follows:

Written exam, final test, reports on laboratory exercises

### Programme content

The subject will discuss the issues of impact and reduction of noise and vibrations in rail means of transport. This will concern negative impacts on people who are in rail vehicles and living on main communication routes. Additionally, the main sources of noise and vibrations in rail vehicles will also be identified.

### Course topics

The lecture program covers the following topics:

1. Introduction to selected issues related to noise and vibration.
2. The impact of sound on humans.
3. The impact of vibrations on humans.
4. Assessment of noise and vibration in the environment.
5. Main sources of noise and vibrations in rail vehicles
6. Summary of classes

The laboratory program covers the following topics:

1. Introduction to the impact of noise and vibration.
2. Assessment of the nuisance impact of noise on humans - spectral analysis.
3. Assessment of noise at the workplace.
4. Assessment of vibrations at the workplace.
5. Assessment of traffic noise.
6. Assessment of vibrations in the locomotive.
7. Summary and passing the classes.

### Teaching methods

1. Lecture with multimedia presentation

## 2. Accounting exercises, field research and preparation of 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    | 2,00 |
| Classes requiring direct contact with the teacher                                                                                       | 30    | 1,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 20    | 1,00 |