COURSE DESCRIPTION CARD - SYLLABUS

Course name
Rail vehicles diagnostic methods [N1Trans1>MDPSz]

Course

Field of study
Transport

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
9

Laboratory classes
9

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the construction and operation of rail vehicles and the physics of phenomena occurring in mechanical objects. Basic knowledge of metrology and the scope of measurements of mechanical quantities. Basic information on linear algebra and statistics. Student has got the ability to obtain information from literature, the Internet, databases and other sources, student can integrate the obtained information, interpret and draw conclusions from it, create and justify opinions.

Course objective

Getting to know the theoretical and practical problems related to the diagnosis of rail vehicles and methods of diagnosing rail vehicles. Construction of a diagnostic system and the ability to use diagnostics in rail vehicle maintenance systems.

Course-related learning outcomes

Knowledge:
1. The student has ordered and theoretically founded general knowledge in the field of key issues of technology and detailed knowledge in the field of selected issues in this discipline of transport engineering.

2. The student has a basic knowledge of the life cycle of means of transport, both equipment and software, and in particular about the key processes occuring in the product life cycle.
3. The student knows the basic techniques, methods and tools used in the process of solving tasks in the field of transport, mainly of an engineering nature engineering.

Skills:
1. The student is able to properly plan and conduct perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions.
2. Student is able, when formulating and solving tasks in the field of transport, to apply appropriately selected methods, including analytical, simulation or experimental methods.
3. The student has the ability to formulate tasks in the field of transport engineering and their implementation using at least one of the popular tools.

Social competences:
1. The student understands that in technology, knowledge and skills very quickly become obsolete.
2. The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life.
3. The student can think and act in an entrepreneurial way, incl. finding commercial applications for the created system, taking into account not only business benefits, but also social benefits of the conducted activity.

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 exam. Obligatory reports on classes. Final examination from practice courses.

Programme content

Anthropechnical system, operator in the action system. Possibilities and methods of operator diagnosis. Introduction to the issues of technical diagnostics of rail vehicles. Diagnostic processes and signals as a source of information about the technical condition of a rail vehicle. Methodology of building a diagnostic system, from functional assumptions to measurement data management and inference. Diagnosing rail vehicles on the basis of working and accompanying processes, non-destructive testing. Diagnostics of the running system, internal combustion engine, electrical machines and auxiliary devices. Wagon diagnostics. Technical and organizational conditions for the use of diagnostics in the rail vehicle operation system. Construction methodology / algorithms of the basic diagnostic system.

Course topics

The course topics cover methods of diagnosing rail vehicles, including diagnostic systems, diagnostic processes and signals, methods of diagnosing the operator, non-destructive testing, diagnostics of running gear, diesel engines, electrical machines, and carriages, as well as the technical and organizational aspects of applying diagnostics in the operation of rail vehicles.

Teaching methods

1. Lecture with multimedia presentation
2. Exercises - solving problems

Bibliography

Basic
1. J. Marciniak: Diagnostyka techniczna kolejowych pojazdów szynowych. WKiŁ, Warszawa 1982.
2. M. Hebda, S. Niziński, H. Pelc: Podstawy diagnostyki pojazdów mechanicznych. WKiŁ, Warszawa 1980.
3. C. Cempel, F. Tomaszewski: Diagnostyka Maszyn. Zasady ogólne, przykłady zastosowań. M.C.N.E.M.T, Radom 1992.
4. B. Żółtowski: Podstawy diagnostyki maszyn. Wydawnictwo. Uczelniane Akademii Techniczno-Rolniczej w Bydgoszczy, Bydgoszcz 1996.

5. R. A. Collacot: Mechanical Fault Diagnosis and Condition Monitoring. Chapman and Hall, London 1977.
Additional
1. A. Sowa: Teoria eksploatacji i diagnostyka pojazdów szynowych, Wydawnictwo Politechniki Krakowskiej, Kraków 2019.
2. T. Nowakowski, P. Komorski, G. M. Szymański, F. Tomaszewski, Wheel-flat detection on trams using envelope analysis with Hilbert transform. Latin American Journal of Solids and Structures, nr 16(1), 2019, p. 1–16, DOI: 10.1590/1679-78255010.
3. M. Sobaś, Diagnostyka osi zestawów kołowych układów biegowych pojazdów trakcyjnych i tocznych, Pojazdy Szynowe nr 4, 2010.
4. T. Antkowiak, Z. Pawlak, Diagnostyka techniczna układu biegowego trakcyjnego pojazdu szynowego, Technika10/2014.
5. T. Nowakowski, M. Motyl, A. Babiak, Uproszczona diagnostyka układu napędowego w eksploatacji, Problemy Kolejnictwa, zeszyt 182, 2019.
6. P. Komorski, T. Nowakowski, G.M. Szymański, F. Tomaszewski, Application of Time-Frequency Analysis of Acoustic Signal to Detecting Flat Places on the Rolling Surface of a Tram Wheel, Dynamical Systems in Applications, 2018
7. B. Zhang, A. C. C. Tan, J. Lin, Gearbox fault diagnosis of high-speed railway train, Engineering Failure Analysis no. 66, 2016.

Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,00
Classes requiring direct contact with the teacher	18	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	12	0,50