



COURSE DESCRIPTION CARD - SYLLABUS

Course name

RAMS analysis of rail vehicles

Course

Field of study

Construction and Exploitation of Means of Transport

Area of study (specialization)

Railway vehicles

Level of study

Second-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

9

Laboratory classes

Tutorials

9

Projects/seminars

9

Other (e.g. online)

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Lądowej i Transportu

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

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Prerequisites

The student starting this course has knowledge of the construction, manufacture, operation of rail vehicles and the use of basic probabilistic and statistical models. The student has the ability to obtain information from the indicated literature sources. Is aware of the need to have knowledge and skills in the field of reliability and safety assessment of rail vehicles and their systems in order to obtain employment in railway companies and related to local public transport.

Course objective

Learning methods, processes, procedures and models in the field of reliability and safety analyzes in rail vehicles and rail vehicle systems and acquiring the ability to use them.



Course-related learning outcomes

Knowledge

The student knows the basic methods, processes, procedures and models used to determine the characteristics of reliability, availability, maintainability and safety at various levels of decomposition of facilities and systems of rail vehicles.

Skills

The student acquires the ability to implement algorithms to determine the measures of reliability, availability, maintainability and safety of facilities and systems of rail vehicles.

Social competences

The student is aware of the importance of the correct application of the methods, processes, procedures and models that make up RAMS analysis, the usefulness and confidence in the results obtained on their basis.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified on the basis of an oral exam taking place after the 8th lecture at the earliest. The exam consists of oral statements on at least 3 detailed questions related to the examination issues. Examination issues, on the basis of which detailed questions are formulated, are forwarded to the student representative in an electronic version, no later than after the fourth lecture, and their content is verified after the last lecture. The lecturer determines the result of the exam.

Completion of the content of exercises is carried out in the form of a written test at the last classes. The test consists of 8-10 questions (test and open-ended) with different scores. The pass mark is 50% of the maximum number of points.

The grade for completing the project classes reflects the substantive and editorial level of the project submitted for evaluation, and is determined by the person conducting the project classes.

Programme content

Lecture. Introduction to RAMS analyzes (Reliability / Reliability, Availability / Readiness, Maintainability / Maintainability, Safety / Security). Reliability analyzes (RAM) in RAMS analyzes of rail vehicles. Structural reliability issues. Reliability of components as objects of non-renewed rail vehicles. Availability and maintainability of components as objects of renewable rail vehicles. Estimating the demand for components and renewable rail vehicle components. Safety analysis (S) in RAMS analyzes of rail vehicles. Risk management at the stage of project concept, design, production, use and maintenance, liquidation and utilization. Risk management methods. Selection of the area of analysis. Security system identification. Hazard identification processes. Risk models and risk risk estimation. Responding to the risk of threats.

Exercise. Determining the reliability of components and systems of rail vehicles in terms of structural reliability. Determining the value of the reliability characteristics of non-renewed components of rail



vehicles. Determining the availability and maintainability measures of the components of the renovated rail vehicles. Overview of the content and rules of application of Regulation 402/2013 on a common safety method in the field of risk evaluation and assessment.

Design. Characteristics of the analyzed system (purpose of operation / appropriate applications / working conditions, description of system components, operating modes, expected durability of the system and its components); determining the requirements and functions of the system; development of a hazard register, taking into account the impact of the environment or system environment and interactions with other systems; evidence of compliance at the system level and the level of its components with regard to the RAMS components using RAMS characteristics and indicators; specification of safety system components, including in connection with planned and unplanned maintenance activities.

Teaching methods

Lecture with the use of multimedia presentations.

Classes: electronic presentations at the stage of formulating problems to be solved, solving fragments of problems on the board by students, a visit to a branch of the Rail Transport Office.

Project: electronic presentation in the phase of project formulation and implementation examples of its components, consultation of the project implementation phases with the person conducting and partial implementation of the project during the classes, implementation of a part of the project scope outside the time of project classes.

Bibliography

Basic

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2. Gill A., Warstwowe modele systemów bezpieczeństwa do zastosowań w transporcie szynowym. Wyd. Politechniki Poznańskiej, Poznań, 2018.
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6. Karpiński J., Korczak E., Metody oceny niezawodności dwustanowych systemów technicznych. Wyd. Omnitech Press, Instytut Badań Systemowych, Warszawa, 1990.



7. Kadziński A., Zarządzanie ryzykiem zagrożeń na stanowiskach pracy. Rozdział 3 w: praca zbiorowa red. L. Lewicki, J. Sadłowska-Wrzesińska, Istotne aspekty BHP. Wydawnictwo Wyższej Szkoły Logistyki, Poznań, 2014, s. 149÷195.
8. Niziński S., Eksploatacja obiektów technicznych. Wydawnictwo Naukowe Instytutu Technologii Eksploatacji – PIB, Warszawa – Sulejówek – Olsztyn – Radom, 2002.
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Additional

1. Daliga M., Przegląd międzynarodowych standardów i metodyk zarządzania ryzykiem w przedsiębiorstwie. Inprogress 2011, <http://www.4pm.pl/upload/artykuly/InLab.pdf>
2. Kaczmarek T.T., Ryzyko i zarządzanie ryzykiem. Ujęcie interdyscyplinarne. Wyd. Difin, Warszawa 2006.
3. Kosieradzka A., Zawiła-Niedźwiecki J., Zaawansowana metodyka oceny ryzyka w publicznym zarządzaniu kryzysowym. Wydawnictwo edu-Libri, Kraków-Legionowo, 2016.
4. Kosmowski K. (red.), Podstawy bezpieczeństwa funkcjonalnego. Wyd. Politechniki Gdańskiej, Gdańsk 2015.
5. Mahboob Qamar, Zio Enrico, Handbook of RAMS in Railway Systems. Theory and Practice. March 29, 2018 Forthcoming by CRC Press.
6. Markowski A. S., Zarządzanie ryzykiem w przemyśle chemicznym i procesowym. Wydawnictwo Politechniki Łódzkiej, Łódź, 2001.
7. Sowa A., Teoria eksploatacji i diagnostyka pojazdów szynowych. Zagadnienia wybrane. Wyd. Politechniki Krakowskiej, Kraków, 2019.
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Breakdown of average student's workload

	Hours	ECTS
Total workload	75	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) ¹	30	1

¹ delete or add other activities as appropriate