



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Advanced Course of Railway Engineering

Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Mass Transport Vehicles

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

english

Requirements

elective

Number of hours

Lecture

18

Laboratory classes

16

Other (e.g. online)

0

Tutorials

0

Projects/seminars

2

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

WILiT lecturers, invited professors and selected specialists from the rail transport industry

Faculty of Civil and Transport Engineering (WILiT)

Piotrowo 3 Street, 61-138 Poznan

Responsible for the course/lecturer:

Ph.D. Eng. Paweł Komorski

email: pawel.komorski@put.poznan.pl

Faculty of Civil and Transport Engineering

Piotrowo 3 Street, 61-138 Poznan

Prerequisites

Basic knowledge about mathematics, physics, engineering materials and the phenomena occurring in mechanical objects. The student is able to use technical drawing and has a spatial imagination in order to read, understand and prepare three-dimensional models of technical objects and their documentation. Basic knowledge of metrology and the scope of measurements of mechanical quantities. Basic information on linear algebra and statistics. The student should have the ability to obtain information from literature, internet, databases and other industry sources, and be able to integrate the information obtained; interpret and draw conclusions from them as well as create and justify own opinions. The student is able to work in a group, taking different roles in it. The student is able to determine the priorities important in solving various tasks.



Course objective

The aim of the course is to learn about theoretical and practical problems related to the mechanics and construction of rail vehicles. Special emphasis is placed on their architecture, design, dynamics, operation and safety. An additional goal is to promote the Poznań University of Technology and Polish culture among foreign students as an attractive place to study.

Course-related learning outcomes

Knowledge

1. Has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations, probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems.
2. Has basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibrations.
3. Has extended basic knowledge necessary to understand specialist subjects and specialist knowledge about the construction, construction methods, manufacturing and operation of a selected group of working, transport, thermal and flow machines covered by the diploma path.

Skills

1. Can obtain information from literature, internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.
2. Can use integrated with the packages for spatial modeling, programs for the calculation of mechanical structures by the finite element method and correctly interpret their results.
3. Can plan and carry out the process of constructing uncomplicated machinery units or machines and formulate requirements for electronic components and automatic control systems for industry specialists in mechatronic systems.
4. Can use popular packages for editing technical drawings and 3D modeling to the extent enabling the creation of drawing documentation in accordance with applicable drawing standards and models of virtual machines in three-dimensional space.

Social competences

1. Is ready to critically assess his knowledge and received content.
2. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on his own.
3. Is ready to fulfill professional roles responsibly, including:
 - observing the rules of professional ethics and requiring this from others,
 - caring for the achievements and traditions of the profession.



Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Monitoring student activity in the eKursy system, discussion as well as ongoing preparation and activity in classes.

Programme content

The implementation of the course will consist in conducting a number of the most important types of classes (lecture, design and laboratory) in the field of mechanics and operation of rail vehicles, i.e. .:

1. Rail Vehicles Dynamics
2. Design of Rail Vehicles
3. Construction of Rail Vehicles
4. Noise and Vibration in Rail Vehicles
5. Dynamic Testing of Rail Vehicle Components
6. Challenges of Modern Rail Transport
7. Safety and Certification of Rail Vehicles
8. Discussion panel with professionals
9. Promotion of the Poznań University of Technology and Polish culture

Teaching methods

1. Lecture with multimedia presentation and films
2. Projects (including exercises and laboratories) - solving case study tasks, conducting experimental research

Bibliography

Basic

1. S. Iwnicki, M. Spiryagin, C. Cole, T. McSweeney, Handbook of Railway Vehicle Dynamics, Second Edition, CRC Press, 2019.
2. M. Spiryagin, C. Cole, Y. Q. Sun, M. McClanachan, V. Spiryagin, T. McSweeney, Design and Simulation of Rail Vehicles, CrC Press, T&Fr Group.
3. D. Thompson, Railway noise and vibration, Elsevier Ltd, 2009

Additional

1. SolidWorks software manual
2. Simpack software manual



3. E. Andersson, M. Berg, S. Stichel, Rail Vehicle Dynamics, Railway Group KTH, Stockholm, 2014.

Breakdown of average student's workload

	Hours	ECTS
Total workload	51	2,0
Classes requiring direct contact with the teacher	36	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	15	0,5

¹ delete or add other activities as appropriate