POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Numerical analyzes of rail vehicle dynamics

Course

Field of study	Year/Semester
Construction and Exploitation of Means of Transport	1/2
Area of study (specialization)	Profile of study
Railway Vehicles	general academic
Level of study	Course offered in
Second-cycle studies	polish/english
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	0	0
Tutorials	Projects/seminars	
0	30	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Bartosz Firlik

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tel. (61) 665 2012

Faculty of Civil and Transport Engineering

ul. Piotrowo 3, pok. 722, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student has a basic knowledge of the dynamics and construction of rail vehicles, in particular their running systems. The student is able to use the acquired knowledge to analyze specific phenomena and processes occurring in the operation of rail vehicles. He has a structured basic knowledge of the main divisions of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body.

Can use learned mathematical theories to create and analyze simple mathematical models of machines and their elements, and simple technical systems. Student is able to solve specific problems that arise during the construction of technical objects.

Course objective

The aim of the course is to learn how to use the MBS (multibody simulation) SIMPACK environment

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aimed at simulating the dynamics of rail vehicles. The student acquires the ability to make models of rail vehicles and simple mechanical systems by the multibody system method.

Course-related learning outcomes

Knowledge

The student has detailed knowledge of the elements used to model multi-body systems, understands the ways of their cooperation and connections and is able to relate them to real objects.

Skills

The student is able to obtain information from literature, the Internet, databases and other sources, in Polish and foreign languages, can communicate using various techniques in the professional environment and other environments using the formal notation of construction, technical drawing. Has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, books and electronic journals.

Social competences

The student understands the need and knows the possibilities of continuous training, knows the need to acquire new knowledge for professional development, is aware of responsibility for his own work and readiness to submit to the principles of teamwork and responsibility for jointly performed tasks, can think and act in an entrepreneurial manner, make decisions, act for the development of the employer and society, is aware of the transfer of the acquired knowledge to the society, makes efforts to make this information understandable.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit with the use of a computer. The final grade includes both the final grade as well as the student's activity during the classes and preparation for them

Programme content

• using the SIMPACK interface, editing the view position, modifying the graphic representation of the designed object, using templates,

• developing and reading the topology of multibody systems based on technical documentation and photos of real vehicles,

• developing models of multibody systems based on available elements (body, joint, constraint, force element), including rail vehicle models,

• preparation of the track and simulation scenario,

• editing simulation conditions, introducing model variants,

• running a simulation,

• postprocessing of simulation results.

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Teaching methods

Multimedia presentation, independent work with computers (SIMPACK software), assessment in the form of online tests. Students can also use the software on private computers, using it for other projects during their studies.

Bibliography

Basic

1. S. Iwnicki , M. Spiryagin, C. Cole, T. McSweeney, Handbook of Railway Vehicle Dynamics, Second Edition, CRC Press, 2019.

2. Simpack tutorials.

Additional

1. M. Spiryagin, C. Cole, Y. Q. Sun, M. McClanachan, V. Spiryagin, T. McSweeney, Design and Simulation of Rail Vehicles, CrC Press, T&Fr Group.

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	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]	20	1,0

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[1] delete or add other activities as appropriate