COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modelling of Physical Systems [S2Trans1>MUF]

Course

Field of study
Transport

Year/Semester
1/1

Area of study (specialization)
Road Transport

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
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

1. Knowledge: Basic knowledge of mathematics, materials science, mechanics, pkm, machine theory and strength of materials obtained during the first degree studies. 2 Skills: Basics of vector and matrix calculus, solving simple problems of endurance, ability to solve ordinary differential equations. 3 Social competences: The student is creative and consistent in the implementation of tasks, shows independence in solving problems, gaining and improving the acquired knowledge and skills.

Course objective

Getting to know a new mathematical modeling processes necessary materials and machines (mechanisms), learn the basics of physical and mathematical modeling of structural materials, mechanisms and machines, some physical processes.

Course-related learning outcomes

Knowledge:
1. Has advanced detailed knowledge of selected issues in the field of transport engineering
2. Knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

Skills:
1. Can use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems
2. Can - when formulating and solving engineering tasks - integrate knowledge from various areas of transport (and, if necessary, also knowledge from other scientific disciplines) and apply a systemic approach, also taking into account non-technical aspects

Social competences:
1. Understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems

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 of the lecture,
-written tests during exercises

Programme content

Notes on modeling - purpose, entities of modeling. Modeling process - stages of modeling, diagram. Physical modeling, simplifying assumptions, physical quantities, examples of physical models. Mathematical modeling, the basics of modeling, tensor quantities, coordinate systems, rules for formulating constitutive relationships, formulating and solving equations of motion in mechanical systems. Mathematical models of construction materials, single-parameter models, complex models, selected non-classical models. One- and two-parameter mechanical systems, equations of motion, undamped and damped vibrations, resonance, self-excited vibrations, vibrations of beams and shafts. Mathematical models of selected processes: thermal systems, hydrodynamic systems. Analogies between physical environments.

Course topics

Notes on modeling - purpose, entities of modeling. Modeling process - stages of modeling, diagram. Physical modeling, simplifying assumptions, physical quantities, examples of physical models. Mathematical modeling, the basics of modeling, tensor quantities, coordinate systems, rules for formulating constitutive relationships, formulating and solving equations of motion in mechanical systems. Mathematical models of construction materials, single-parameter models, complex models, selected non-classical models. One- and two-parameter mechanical systems, equations of motion, undamped and damped vibrations, resonance, self-excited vibrations, vibrations of beams and shafts. Mathematical models of selected processes: thermal systems, hydrodynamic systems. Analogies between physical environments.

Teaching methods

Classic lectures and tutorials with the use of multimedia methods

Bibliography

Basic
1. Ostrowska-Maciejewska; Podstawy mechaniki ośrodków ciągłych, PWN, Warszawa 1982
2. W. Flügge; Tensor analysis and continuum mechanics, Springer-Verlag, Berlin 1972
3. R. H. Cannon jr.; Dynamika układów fizycznych, WNT, Warszawa 1973
Additional
1. Z. Parszewski; Drgania i dynamika maszyn, WNT, Warszawa 1982
2. R. Scanlan, R. Rosenbaum; Drgania i flatter samolotów, PWN, Warszawa 1964
3. W. Tarnowski; Modelowanie systemów, Wyd. Politechniki Koszalińskiej, Koszalin 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	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)	25	1,00