COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of Computer Aided Vehicle Design

Course

Field of study
Construction and Exploitation of Means of Transport

Year/Semester
4 / 7

Area of study (specialization)
Motor vehicles

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
45	15	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Marek Maciejewski

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of applied mechanics and material strength. Approximation and interpolation. Discretization of continuous issues. Knowledge of the basic computational methods of algebra. Basic practice in computer skills, and running computer programs in the scope of numerical methods. Understanding the need to use numerical methods and evaluate their properties (accuracy, stability). The ability to correctly select numerical methods, to estimate the effects of their application, to quantify and qualify the results, and to relate these results to real conditions.

Course objective

A simple and demonstrative introduction to the basic issues related to computer calculations in the field of mechanics and strength of structures, with particular reference to motor vehicles. Explanation of the similarities and differences in the analysis of continuous and discrete systems, together with a description of the methods and effects of appropriate transformations.

Course-related learning outcomes

Knowledge

1. Knows the classification of mechanics. 2. Knows the transformation methods of continuous to

discrete systems. 3. Knows numerical methods used in solving discrete systems. 4. Knows the basics of the finite element method and other discretization methods.

Skills

1. Can classify a continuous problem and indicate methods appropriate to its solution. 2. Transforms the continuous to discrete system according to the imposed requirements. 3. Can choose the right numerical methods for the problem to be solved. 4. Understands programming aspects of finite element method.

Social competences

1. Is able to justify the consequences of using computer methods to solve problems of mechanics related to the calculations of motor vehicles. 2. Understands the need to present and solve problems of vehicle mechanics as a sequence of numerical solutions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written credit for lectures (colloquium), and credit for laboratory classes based on the results of project tasks.

Programme content

Mathematical description of real physical phenomena and processes. Discussion of the classification of systems of differential and integral equations of the first and second order. Associating the classification of systems with approaches to their correct solving. The importance of boundary and initial conditions. Approximative methods for solving systems of differential equations. Discretization of physical problems. Approximation and discretization within the finite element method. Examples of implementation of the method in relation to simple objects. Aggregation of the matrix of coefficients. Solving systems of linear equations for exemplary implementation of the method. Other approaches and methods. Computer systems. Applications in structural mechanics and aerodynamics of vehicles.

Teaching methods

1. Lecture: multimedia presentation. 2. Laboratory classes: conducting computer simulations of simplified vehicle models in the field of structural mechanics.

Bibliography

Basic

1. Łodygowski T., Kąkol W., Metoda elementów skończonych w wybranych zagadnieniach mechaniki konstrukcji inżynierskich, WPP 1994, Poznań

2. Kleiber M., Wprowadzenie do metody elementów skończonych, WPP 1984, Poznań

3. Kleiber M., Numeryczna analiza statycznych i dynamicznych zagadnień stateczności konstrukcji, WPP 1987, Poznań

4. Zienkiewicz O.C., Metoda elementów skończonych, Arkady 1972, Warszawa

Additional

1. Saouma, V.E., Matrix structural analysis, with an introduction to finite elements, University of Colorado, 1999

Breakdown of average student's workload

	Hours	ECTS
Total workload	85	3,0
Classes requiring direct contact with the teacher	60	2,1
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	0,9

[1] delete or add other activities as appropriate