



1. Subject name	Vehicle system dynamics III.				
2. Subject name in Hungarian	Járműrendszerdinamika III.				
3. Code	BMEKOVJD014	4. Evaluation type	exam grade	5. Credits	4
6. Weekly contact hours	2 (0) Lecture	0 (0) Practice	0 (0) Lab		
7. Curriculum	PhD Programme	8. Role	Basic course		
9. Working hours for fulfilling the requirements of the subject					120
Contact hours	28	Preparation for seminars	30	Homework	0
Reading written materials	30	Midterm preparation	0	Exam preparation	32
10. Department	Department of Aeronautics and Naval Architectures				
11. Responsible lecturer	Dr. Szabó András				
12. Lecturers	Dr. Szabó András				
13. Prerequisites	recommended: BMEKOVJD008 - Vehicle system dynamics II.				
14. Description of lectures					
<p>Distributed parameter beam model of the transportation track on elastic foundation. Treatment of the moving load acting on the track model. Models of system dynamics: lumped parameter models, distributed parameter models and hybrid models. Connecting the track/vehicle models, complex model formation. The degree of freedom of the models. Constraint equations. Gravity point position characterising free coordinates and acceleration-coupled systems. Forces arising in the track/vehicle system. Geometric and parametric track irregularities acting on the system as excitation effects. Generation of the motion equations of the system by synthetic method. Specifying the wheel and rail profiles. Computing the normal forces acting on the rail surface. Prediction of the wheel and rail wear by simulation. Conditions of the stable running. Numerical stability analysis. Nonlinear effects after loss of dynamical stability, the limit-cycle motion. The lateral dynamical model of the railway track/vehicle system using the continuum model of the track. Numerical simulation. Beam models of different detail level of the railway track for moving vertical loads. Solution to the boundary value problem. Treatment of the complex coefficient algebraic equation emerging in the course of the numerical analysis. The combined modelling of the track and the lumped parameter vehicle moving along it, as a hybrid dynamical system.</p>					
15. Description of practices					
16. Description of laboratory practices					
17. Learning outcomes					
<p>A. Knowledge B. Skills</p> <ul style="list-style-type: none"> Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: possibilities for modelling the railway-track/vehicle dynamical system; methods of generating the system-equations; transformation procedures connected to the system modelling; solution methods for the geometrical contact of wheel and rail; possibilities of taking into consideration the parametric excitation caused by the track stiffness inhomogeneity. <p>C. Attitudes D. Autonomy and Responsibility</p> <ul style="list-style-type: none"> Students must pursue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new resource activities in new fields of knowledge in an innovative way. 					
18. Requirements, way to determine a grade (obtain a signature)					
Regular participation at the lectures and written exam.					
19. Opportunity for repeat/retake and delayed completion					
According to the TVSZ.					
20. Learning materials					
1. Szabó, A.: Járműrendszerdinamika III. Kézirat. BME Vasúti Járművek és Járműrendszeranalízis Tanszék. Budapest, 2012.					

2. Zoller, V.: Elosztott paraméteres és hibrid drinamikai rendszerek. BME Vasúti Járművek és Jármű-rendszeranalízis Tanszék. Budapest, 2011.

3. Zábori, Z.. Hibrid közlekedési pálya-jármű rendszer keresztirányú dinamikája. Kézirat. BME Vasúti Járművek és Járműrendszeranalízis Tanszék. Budapest, 2010.

Effective date

27 November 2019

This Subject Datasheet is valid for

Inactive courses
