



1. Subject name	Vehicle dynamics				
2. Subject name in Hungarian	Járműdinamika				
3. Code	BMEKOGGM705	4. Evaluation type	exam grade	5. Credits	3
6. Weekly contact hours	2 (28) Lecture	0 (0) Practice	1 (14) Lab		
7. Curriculum	Autonomous Vehicle Control Engineering MSc (A)	8. Role	Mandatory (mc) at Autonomous Vehicle Control Engineering MSc (A)		
9. Working hours for fulfilling the requirements of the subject					90
Contact hours	42	Preparation for seminars	0	Homework	20
Reading written materials	10	Midterm preparation	8	Exam preparation	10
10. Department	Department of Automotive Technologies				
11. Responsible lecturer	Dr. Szalay Zsolt				
12. Lecturers	Vass Sándor				
13. Prerequisites					
14. Description of lectures					

The aim of the course is to familiarize students with the dynamic models of road vehicles. Within the scope of the course, students will be able to familiarize themselves with the various combined longitudinal and transverse vehicle dynamics models of vehicle and vehicle combinations, including tire models. The subject assumes basic mechanical mechanics of the vehicle.

Vehicle behavior and stability issues.

Modeling Basics.

Modeling solo vehicles with a bike model.

Modeling trailers with a bike model.

Two-gauge four-wheeled vehicle model.

Two-gauge four-wheeled vehicle model with trailer.

Basic rubber modeling considerations.

Tire brush model.

The "Magic Formula" tire model.

The "tight string" tire model.

Analysis of three modern tire models. (RMOD-K, Ftire, MF-Swift)

#### 15. Description of practices

#### 16. Description of laboratory practices

Computer exercises; MATLAB and [SIMULINK](#) programming, implementation of vehicle models presented in lectures.

#### 17. Learning outcomes

##### A. Knowledge

- knows the basic vehicle dynamics modeling paradigms
- is familiar with the dynamic behavior of vehicles, the terms used to describe them and their meaning
- knows different vehicle models
- knows the so-called bicycle model and bicycle model for trailer vehicles
- is familiar with two-track vehicle models and their trailer description
- is aware of the basic problems of vehicle-track connection
- knows the different wheel models, the Magic formula, the tight string, and the modern tire models

##### B. Skills

- is capable of creating a vehicle dynamics model based on a specified vehicle description
- is able to apply vehicle dynamics models in design
- is able to select a model suitable for the specified vehicle control task

- is able to understand and use other vehicle models based on their knowledge
- capable of modeling the vehicle-track connection in a special environment

#### C. Attitudes

- open to the use of new vehicle dynamics models
- open to the combined use of vehicle dynamics and other knowledge
- collaborates with student peers and trainers to address various issues

#### D. Autonomy and Responsibility

- independently expand its knowledge in modeling IT solutions
- examines technical tasks in system-level thinking
- is responsible for performing a dynamic task entrusted to it, which provides support to its staff

### 18. Requirements, way to determine a grade (obtain a signature)

One midterm exam and one individual homework. Final grade comes from the result of exam.

### 19. Opportunity for repeat/retake and delayed completion

The midterm exam can be retried once or the individual homework can be delayed completed.

### 20. Learning materials

Hans Pacejka: Tire and Vehicle Dynamics, Elsevier, Oxford, 2012

<b>Effective date</b>	10 October 2019	<b>This Subject Datasheet is valid for</b>	Inactive courses
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