1. Subject name	**Vehicle system dynamics and control**				
2. Subject name in Hungarian	Járműrendszerdinamika és kontroll				
3. Code	**BMEKOVRM636**	4. Evaluation type	**exam grade**	5. Credits	**8**
6. Weekly contact hours	**3 (14) Lecture**	**2 (9) Practice**	**1 (5) Lab**		
7. Curriculum	**Vehicle Engineering MSc (J)**	8. Role	**Specialization (sp) at Vehicle Engineering MSc (J)**		
9. Working hours for fulfilling the requirements of the subject					**240**
Contact hours	84	Preparation for seminars	21	Homework	60
Reading written materials	50	Midterm preparation	0	Exam preparation	25
10. Department	**Department of Aeronautics and Naval Architectures**				
11. Responsible lecturer	Dr. Zobory István				
12. Lecturers	Dr. Zobory István, Dr. Gáspár Péter				
13. Prerequisites					

14. Description of lectures

Analysis of dynamical models apt for examining the main motion of vehicles and vehicle-strings, as well as traffic flows. The non-linear dynamic model of the force transfer in rolling contact with regard to stochasticity coming from tribological properties. Motion equations of lumped parameter models capable for vibrations describing vehicle system. The forces and motion excitation, as well as parametric excitations. The stochastic ordinary differential equation system of the discrete dynamical system. Constraction of motion equation systems of distributed parameter vehicle systems. The stochastic partial differential equation system of the distributed parameter dynamical system. The vehicle dynamical systems as a controlled or regulated section. Formulation of some typical vehicle dynamical task for control, with operation-technical explanation of the control signals. The vehicle control problem formulated by model based methods. Methods apt for designing vehicle control. Failure detecting in the vehicle control system. Design of vehicle control of reconfigurating and fault-toleranting character. Design of integrated control and inspection control. Case studies concerning controlled vehicle dynamical systems.

15. Description of practices

Exercising of the theoretical material by the solving of the numerical examples in MATLAB computation environment.

16. Description of labortory practices

Analysis, comparison and evaluation of the simulation procedures in MATLAB environment.

17. Learning outcomes

A. Knowledge

- Understands and applies the mathematical and scientific principles, relations and procedures necessary to cultivate professional area of the vehicle system dynamic and the vehicle control.
- Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of vehicle system dynamics and vehicle control.
- In details knows and understands the methods and problem solving techniques of the vehicle system dynamics and vehicle control.
- Knows and understands the tools and methods of the computer modelling and simulation which are usable in the vehicle system dynamics and vehicle control.
- Knows the problem solving techniques which are applicable in the research or scientific work.

B. Skills

- Able to apply the required mathematical and scientific principles and procedures for solving the problems connected with the vehicle system dynamics and vehicle control.
- Able to apply in innovative way the principles and terminologies of the vehicle system dynamics and vehicle control.
- Able to identify, to evaluate and manage by system-approach the effect mechanism of the vehicle system dynamics and vehicle control processes.

C. Attitudes

- Open and receptive to know and to accept the technology developments and innovations which are taken place on the field of the speciality of vehicle system dynamics and vehicle control.
- Accepts the professional and ethical values-system connected with the technical professional area.
- Pursuing to use complex and on system-oriented mentality based approach to the processes.
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D. Autonomy and Responsibility

- Pro-activity in the solution of professional tasks, the self-standing selection of the solution methods.

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

During the semester there is necessary to solve some simulational subtasks (for the evaluation of the knowledge, ability, attitude and autonomy)(2 pieces). The final evaluation of the knowledge and ability will be at in the framework of an examiantion, at the end of the semester. The criterion of signature is the complete solving of all tasks of the semester.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Zobory I.: Járműrendszerdinamika. (Lineáris időinvariáns rendszerek)
Bokor J., Gáspár P., Kohut M., Kurutz K.: Szabályozástechnika I.
Gillespie, T.D.: Fundamentals of vehicle dynamics
Kiencke U., Nielsen L.: Automotive control systems

Effective date	10 October 2019	This Subject Datasheet is valid for	Inactive courses