1. Subject name	**Control theory**				
2. Subject name in Hungarian	Irányításelmélet				
3. Code	**BMEKOKAM142**	4. Evaluation type	**exam grade**	5. Credits	**3**
6. Weekly contact hours	**2 (9) Lecture**	**1 (5) Practice**	**0 (0) Lab**		
7. Curriculum	**Vehicle Engineering MSc (J)** **Transportation Engineering MSc (K)**	8. Role	**Mandatory (mc) at Vehicle Engineering MSc (J)** **Mandatory (mc) at Transportation Engineering MSc (K)**		
9. Working hours for fulfilling the requirements of the subject					**90**
Contact hours	42	Preparation for seminars	8	Homework	0
Reading written materials	13	Midterm preparation	12	Exam preparation	15
10. Department	**Department of Control for Transportation and Vehicle Systems**				
11. Responsible lecturer	Dr. Gáspár Péter				
12. Lecturers	Dr. Gáspár Péter				
13. Prerequisites					

14. Description of lectures

Introduction. Recap on the basic concepts of control theory and stability theory (stability conditions, stability of closed loop systems). State space theory (state space representations and properties, transformations). Continuous state space of linear time-variant dynamic systems. Control in state space. State feedback design. Optimal controls. Linear Quadratic Controller Design (LQR). Computer controlled systems. Designing discrete controls. Observability, controllability properties. Stability.
State estimation. Kalman filtering. Problems from different means of transport :road, air, logistics. Presentation of design tasks through vehicle, transport and logistic examples. Computer-oriented control theory tasks. Outlook (introductory, problematic). Postmodern techniques. Predictive controls. Error detection and importance in transport. MIMO systems. Nonlinear systems.

15. Description of practices

Implementation of the methods learned during the lectures

16. Description of labortory practices

17. Learning outcomes

A. Knowledge
- knows the basic dynamic system modeling paradigms, their mathematical background
- knows the time and frequency range description of linear time-variant systems
- knows the principles of regulation, their quantitative and qualitative criteria
- is familiar with various simple feedback control methods
- knows the basics of modern control theory, the principles of quadratic regulation
- knows the methods of filter design

B. Skills
- capable of modeling of a specified system
- is able to independently design a specific system model
- is able to apply the estimation design methods independently
- is able to handle the most common control design softwares

C. Attitudes
- is interested in a mathematical solution to control problems
- endeavor to effectively apply the word technology knowledge through practical problems
- acquires system-level thinking

D. Autonomy and Responsibility

- can independently provide quality and quantity parameters for a system's performance, enabling them to make decisions about system redesign
- can independently describe a particular system, use the appropriate mathematical formalisms
- is able to make decisions on the appropriate methods of solving the control task

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

Two midsemester exams, min. 70% presence on lectures and seminars, which are the prerequisite of the final exam. The final grade depends only on the final exam.

19. Opportunity for repeat/retake and delayed completion

Both midsemester exams can be retried once.

20. Learning materials

Lecture Notes, Kailath: Linear Systems, Prentice Hall

Effective date	10 October 2019	**This Subject Datasheet is valid for**	2024/2025 semester II