Mathematical methods I.

1. Subject name	Mathematical methods I.				
2. Subject name in Hungarian	Matematikai módszerek I.				
3. Code	BMEKOKAD003	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	56	Preparation for seminars	20	Homework	10
Reading written materials	10	Midterm preparation	0	Exam preparation	24
10. Department	Department of Control for Transportation and Vehicle Systems				
11. Responsible lecturer	Dr. Péter Tamás				
12. Lecturers	Dr. Péter Tamás				
13. Prerequisites					

14. Description of lectures

1. Extreme value theorem.
2. Regression analysis. The basic equation of regression. Ritz method. Regression surface. Multidimensional regression. Scalar vector function. Regression of vector-vector function. Complex function regression. Implicit function regression. Regression of a Parameter Assigned Function. Regression of the space curve Special Regression Procedures. Statistical linearization method. SISO and MIMO models. Harmonic linearization. Inverse linearization.
3. Calculus of variations. Functional concept. Subject of the variation calculation. The "Brachisztochron problem". The Ritz method. The Lemma of variation calculation. The Euler-Lagrange equation. The variational method in mechanics.
4. The equation of motion, in mathematical physics. The variation principle in mechanics. The Hamilton's principle. Applications for dynamic systems. Lagrange equations. Fermat's principle in geometrical optics.
5. Theory of Linear Systems. Zadeh's definition of the system. Abstract objects. Equivalence of two or more objects. Convolution, convolution batch. Weight function batch, SISO and MIMO systems. Transmission matrix and weight function matrix..
6. The Stochastic processes. Definition. Classification. Categories. The multivariate distribution. The Stationarity. Determining the expected value of the process and its autocorrelation function. The ergodic processes. Auto and cross correlation function Definition of auto and cross spectrum Properties. SISO and MIMO systems. The definition of spectral density. Definition and relationship of spectra. Calculation of spectral density.

15. Description of practices

16. Description of labortory practices

17. Learning outcomes

A. Knowledge B. Skills C. Attitudes D. Autonomy and Responsibility

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

The credits are obtained by completing the assignment and by passing the oral exam.

19. Opportunity for repeat/retake and delayed completion

20. Learning materials

Effective date	27 November 2019	This Subject Datasheet is valid for	Inactive courses