1. Subject name	**Stochasic Processes in System Dynamics III.**				
2. Subject name in Hungarian	Sztochasztikus folyamatok a rendszerdinamikában III.				
3. Code	**BMEKOVJD011**	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	15
Reading written materials	15	Midterm preparation	0	Exam preparation	32
10. Department	**Department of Aeronautics and Naval Architectures**				
11. Responsible lecturer	Dr. Zobory István				
12. Lecturers	Dr. Zobory István				
13. Prerequisites	**recommended: BMEKOVJD009 - Stochasic Processes in System Dynamics I.** **recommended: BMEKOVJD010 - Stochasic Processes in System Dynamics II.**				

14. Description of lectures

Transfer system characterized by a stochastic differential equation. Convergence concepts for stochastic sequences. The derivative process of a stochastic process. Harmonic oscillator excited by a stochastic process. Analytic concepts with respect to the convergence in the mean square. The transfer theorem. Tracing back the limit value, the continuity, the differentiability and the integrability in the mean square sense, to the properties of the (deterministic) autocorrelation function of the process. Characteristics in the mean square sense for second order weakly stationary processes. Level exceeding circumstances with stochastic processes. Generating realisation functions of second order weakly stationary processes. Spectral representation of second order weakly stationary processes. The concept of random measure and the stochastic integral defined on the basis of it. Stochastic characterisation of deterministic functions. The Brown-motion process and the white-noise. Characterisation of the time history of stochastic processes. The theorem of iterated logarithm. Further features of the Brown-motion process. The continuity and non-differentiability of the Brown-motion process. Generalized functions and stochastic processes. Defining stochastic integral. The stochastic integral leads to martingals. The extended definition of the conditional expectation. The extended definition of the conditional probability. Non-anticipative functions. Solutions to stochastic differential equations. The Ito-type stochastic differential equation. Existence and unicity of the solution. Reqired properties for unuque solvability of stochastic differential equation systems. The question on the existence of a global solution. Autonom stochastic differential equation. Linear stochastic differential equation. The homogeneous case. The non-homo¬geneous case. The Ornstein-Uhlenbeck process

15. Description of practices

16. Description of labortory practices

17. Learning outcomes

A. Knowledge B. Skills

- 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: solution procedures applicable for stochastic differential equations; mapping of the real processes on Markovian model.

C. Attitudes D. Autonomy and Responsibility

- Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way

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

Accepted homework sent before the deadline and written exam.

19. Opportunity for repeat/retake and delayed completion

According to the TVSZ

20. Learning materials

1. Zobory, I.: Sztochasztikus folyamatok a rendszerdinamikában I. Kézirat. BME Vasúti Járművek és Járműrendszeranalízis Tanszék. Budapest, 2011.
2. Arnold, L.: Sztochasztikus differenciálegyenletek Tipotex, Budapest, 2013.

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