1. Subject name	**Stochasic Processes in System Dynamics II.**				
2. Subject name in Hungarian	Sztochasztikus folyamatok a rendszerdinamikában II.				
3. Code	**BMEKOVJD010**	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.**				

14. Description of lectures

Horizontal and vertical treatment of stochastic processes. The fundamental theorem of Kolmogorov. Characteristic functions of stochastic processes. Expected value function, momentum functions and autocorrelation function. The Hilbert-space L2(□,A,P). The stochastic process as an “in-space curve” in the Hilbert-space. Some simple stochastic processes. The manifold of straight lines of random position. Stochastic differential equations, two characteristic types. Point processes, counting processes. The three conditions together result in a Poisson-process. Characteristic functions of the Poisson-process. Secondary processes generated by point process. The one-dimen¬sional marginal distribution. The one-dimensional limit-distribution. Renewal processes. Smith-theorem of the renewal theory. Operation process model for machinery systems, generated by a point process. Torque process and RPM process of the driving shaft. Determining the joint limit distribution by using the theorem of complete probability. Some simple variations for point process generated secondary process. Markov-chains and processes. Properties of the transition probability matrices. Marginal distributions of the Markov-chain. Single dimensional random walk on the integers. Stationary Markov-chains. Ergodic Markov-chains. Transition-density functions. The Chapman-Kolmogorov equation. The birth-death process. Model for the service-theory. Permanent distribution. Stationary processes. Strict- and weak stationarity of different order. Spectral properties. Ergodicity with respect to the expected value function and to the autocorrelation function. Gaussian-processes. Basic properties of the Brown-motion process. Characteristic functions of the Brown-motion 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: characteristic operations for stochastic processes; methods of application of point processes; procedures for applying Markov-chains; applicability of Markov-chains concerning the solution to mass-service tasks; the analytic properties of stochastic processes.

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