

Course description

Course abbreviation:	KKY/STP	Page:	1 / 3
Course name:	Stochastic Systems and Processes		
Academic Year:	2023/2024	Printed:	01.06.2024 09:03

Department/Unit /	KKY / STP			Academic Year	2023/2024
Title	Stochastic Systems and Processes			Type of completion	Exam
Accredited/Credits	Yes, 6 Cred.			Type of completion	Combined
Number of hours	Lecture 3 [Hours/Week] Tutorial 2 [Hours/Week]			Course credit prior to	YES
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	30 / -	0 / -	0 / -	Min. (B+C) students	10
Winter semester	0 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Summer semester
Language of instruction	Czech			Internship duration	0
Optional course	Yes			Ev. sc. – cred.	S/N
Evaluation scale	1 2 3 4				
No. of hours of on-premise					
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The aim of the course is to introduce students to basic properties of stochastic systems and processes.

Requirements on student

Test and elaboration of two written reports and to understand content of the lectures.

Content

- 1.Introduction, description of reality and uncertainty, deterministic and stochastic approach, relation, projection,topological space,
- 2.Measurable space and projection, Lebesgue and Radon-Nikodin theorems,
- 3.Probability and decision making in control, probability space,
- 4.Conditional probability,independence,Bayesian theorem, random variables and their description,
- 5.Vector random variable,distribution function, probability density functions, moments,
- 6.Transformation of random variables,
- 7.Random processes and their description,
- 8.Markov, Gaussian, white, Poisson, stacionary, ergodic processes,
- 9.Introduction to stochastic system theory, causal stochastic system,
- 10.Phenomenological and state theory for stochastic systems,
- 11.Linear stochastic system, state space and input output models,
- 12.Linear stochastic system, description of input, state and output processes,
- 13.Spectral factorization of discrete time random process.

Fields of study

Guarantors and lecturers

- **Guarantors:** Doc. Ing. Ondřej Straka, Ph.D. (100%)
- **Lecturer:** Doc. Ing. Ondřej Straka, Ph.D. (100%)
- **Tutorial lecturer:** Ing. Jiří Ajgl, Ph.D. (100%), Ing. Oliver Kost, Ph.D. (100%), Doc. Ing. Ondřej Straka, Ph.D. (100%)

Literature

- **Recommended:** Šimandl, Miroslav. *Identifikace systémů a filtrace*. Plzeň : ZČU, 1995. ISBN 80-7082-170-1.
- **Recommended:** Havrda, Jan. *Náhodné procesy*. dot. 1. vyd. Praha : ČVUT, 1980.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Contact hours	39
Practical training (number of hours)	26
Undergraduate study programme term essay (20-40)	30
Preparation for formative assessments (2-20)	20
Preparation for an examination (30-60)	50
Total:	165

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Combined exam
Test

Skills - skills achieved by taking this course are verified by the following means:

Seminar work

Competences - competence achieved by taking this course are verified by the following means:

Combined exam
Seminar work
Test

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

disponovat znalostmi základních technik integrálního počtu
disponovat znalostmi základů lineární algebry
disponovat znalostmi základů teorie pravděpodobnosti

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

kombinovat pravděpodobnosti nad množinami jevů
použít techniky integrálního počtu při práci s náhodnými veličinami
pracovat s maticemi, analyzovat jejich vlastnosti

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

N/A

N/A

teaching methods**Knowledge - the following training methods are used to achieve the required knowledge:**

Lecture

Skills - the following training methods are used to achieve the required skills:

Individual study

Practicum

Competences - the following training methods are used to achieve the required competences:

Individual study

Lecture

Practicum

learning outcomes**Knowledge - knowledge resulting from the course:**

charakterizovat neurčitosti přítomné v systému

charakterizovat náhodné veličiny

charakterizovat stochastický proces

vyjádřit rozdíl mezi deterministickým a stochastickým systémem

Skills - skills resulting from the course:

analyzovat vlastnosti náhodných procesů přítomných v systému

konstruovat lineární model popisující stochastický systém spojitý i diskrétní v čase

popsat stochastický systém včetně charakteristik neurčitostí

vyjádřit pravděpodobnostní závislosti mezi procesy přítomnými v systému

využít Bayesův přístup při zpracování informace

Competences - competences resulting from the course:

N/A

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Applied Sciences and Bachelor Computer Engineering		Full-time	Cybernetics and Control Engineering	1	2018	2023	Povinné předměty	A	3	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1	2023	2023	Povinné předměty	A	3	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1	2019	2023	Povinné předměty	A	3	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Automatic Control and Robotics	1	2019	2023	Povinné předměty	A	3	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Automatic Control and Robotics	1	2023	2023	Povinné předměty	A	3	LS