

Course description

Course abbreviation:	KKY/LŘS	Page:	1 / 4
Course name:	Linear Control Systems		
Academic Year:	2023/2024	Printed:	26.05.2024 17:16

Department/Unit /	KKY / LŘS			Academic Year	2023/2024
Title	Linear Control Systems			Type of completion	Exam
Accredited/Credits	Yes, 4 Cred.			Type of completion	Combined
Number of hours	Lecture 3 [Hours/Week] Tutorial 1 [Hours/Week]			Course credit prior to	YES
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	0 / -	1 / -	0 / -	Min. (B+C) students	10
Winter semester	0 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Summer semester
Language of instruction	Czech, German			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	KKY/AŘI, KKY/SZTRĚ, KKY/TRSZ				

Course objectives:

The purpose of the course is to ensure that student should

- get an overview of automatic control problems, structures of control systems and basic types of dynamic and non-dynamic controllers.
- be able to analyse a real regulation problem, to formulate requirements on the quality of regulation in time and frequency domains
- use and apply proper methods for the design of continuous and discrete controllers
- analyse non-linear dynamic systems and apply basic control principles to non-linear dynamic systems.

Requirements on student

Students must solve a wide range of particular tasks applying to the majority of lecture notes. Further, they elaborate a semestral work and are awaited to defend their work and give necessary comments. Oral and written examination on the subject is requested.

Content

Basic control problems, quality limitations. Continuous and discrete control systems, sampling theorem and signal reconstruction. Discrete models of continuous linear dynamical systems. Mathematical models, data-driven system identification. Set point control, tracking problems, disturbance attenuation, 1DoF and 2DoF controllers. Basic types of controllers. Frequency and time domain design methods, pole-placement. State observers, dynamical compensator. Non-linear dynamical systems, harmonic linearization. Ljapunov's stability theory.

Fields of study

Studentům je k dispozici kurz v Google Classroom se všemi podstatnými informacemi a materiály.

Guarantors and lecturers

- **Guarantors:** Ing. Martin Gouběj, Ph.D. (100%)
- **Lecturer:** Ing. Martin Gouběj, Ph.D. (100%)
- **Tutorial lecturer:** Ing. Martin Gouběj, Ph.D. (100%)

Literature

- **Recommended:** Wittenmark, Bjorn. *Computer-controlled systems : theory and design*. 2nd ed. Englewood Cliffs : Prentice-Hall, 1990. ISBN 0-13-172784-2.
- **Recommended:** Goodwin, Graham Clifford; Graebe, Stefan F.; Salgado, Mario E. *Control system design*. Upper Saddle River : Prentice Hall, 2001. ISBN 0-13-958653-9.
- **Recommended:** Lineární systémy 2 (Melichar J.) - www.kky.zcu.cz/cs/courses/ls2 >
- **Recommended:** Havlena, Vladimír. *Moderní teorie řízení : doplňkové skriptum*. 1. vyd, dotisk. Praha : Vydavatelství ČVUT, 2001. ISBN 80-01-02036-3.

Time requirements**All forms of study**

Activities	Time requirements for activity [h]
Contact hours	39
Undergraduate study programme term essay (20-40)	20
Practical training (number of hours)	13
Preparation for an examination (30-60)	30
Preparation for comprehensive test (10-40)	10
Total:	112

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:

- Skills demonstration during practicum
- Combined exam

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

- Seminar work

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

- disponovat základními znalostmi z matematiky
- disponovat základními znalostmi z fyziky
- disponovat základními znalostmi z lineární algebry
- disponovat základními znalostmi z výpočetní techniky

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

matematicky formulovat zadaný problém

samostatně pracovat v SW nástrojích Matlab a Simulink

využívat elementární znalosti z matematiky a fyziky k popisu jevů probíhajících v dynamických systémech

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

N/A

teaching methods

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

Interactive lecture

Self-study of literature

Individual study

One-to-One tutorial

Discussion

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

Laboratory work

Practicum

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

Task-based study method

Skills demonstration

learning outcomes

Knowledge - knowledge resulting from the course:

využívat metody matematicko-fyzikálního modelování

identifikovat model systému na základě experimentu

formulovat požadavky na chování a vlastnosti regulačního procesu při současném respektování omezení

Skills - skills resulting from the course:

vytvořit matematický model reálného systému matematicko-fyzikálním modelováním nebo identifikací na základě naměřených dat

zvolit optimální metodu pro řešení dané úlohy návrhu regulačního obvodu

ověřit funkčnost návrhu regulátoru, případně navrhnout variantní řešení

řešit dílčí problémy, které jsou spojeny s řízením nelineárních systémů

Competences - competences resulting from the course:

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.
Electrical Power Engineering	Postgraduate Master	Full-time	Power Electronics Technology and Drives	1	20		2023	block VSEE-VT1	B	1	LS
Electrical Power Engineering	Postgraduate Master	Full-time	Power Electronics Technology and Drives	1	20		2023	block VSEE-VT1	B	1	LS
Electronics and Information Technology	Postgraduate Master	Full-time	Elektronics	1	20		2023	block EITE-EL1	B	2	LS
Electronics and Information Technology	Postgraduate Master	Full-time	Power Electronics Technology	1	20		2023	block EITE-VE2	B	1	LS
Electronics and Information Technology	Postgraduate Master	Full-time	Elektronics	1	20		2023	block EITE-EL1	B	2	LS

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Electronics and Information Technology	Postgraduate Master	Full-time	Power Electronics Technology	1	20	2023	block EITE-VE2	B	1	LS
