# Course description

Course abbreviation:	KKY/BIO Biocybernetic	2				Page:	1 / 4
Academic Year:	2023/2024	5			Printed:	15.07.2025	22:51
Department/Unit /	KKY / BIO				Academic Year	2023/2024	
Title	Biocybernetic	S			Type of completion	Exam	
Accredited/Credits	Yes, 4 Cred.				Type of completion	Written	
Number of hours	Lecture 2 [Ho	urs/Week] Tutor	rial 2 [Hours/W	eek]			
Occ/max	Status A	Status B	Status C		Course credit prior to	Yes	
Summer semester	0 / -	4 / -	0 / -		Counted into average	YES	
Winter semester	0 / -	0 / -	0 / -		Min. (B+C) students	10	
Timetable	Yes				Repeated registration	NO	
Language of instruction	Czech				Semester taught	Winter, Su	mmer
Optional course	Yes				Internship duration	0	
Evaluation scale	1 2 3 4				Ev. sc. – cred.	S N	
No. of hours of on-premise							
Auto acc. of credit	Yes in the cas	e of a previous e	evaluation 4 net	oo nic.			
Periodicity	every year						
Specification periodicity							
Substituted course	None						
Preclusive courses	N/A						
Prerequisite courses	N/A						
Informally recomm	nended courses	KKY/UIM					
Courses depending	on this Course	N/A					

#### Course objectives:

The aim of the course is to become acquainted with fundamental physiological processes in the human body and biocybernetical modeling of these processes.

#### Requirements on student

Credit prior to exam: elaborate a measurement protocol, individual semestral work Exam: appropriate knowledge of presented material and practiced examples

#### Content

Fundamental physiological principles. Monitoring systems of the organism, sensors, medical signal processing. Modeling and simulation of biological systems. Pharmacokinetics. Analysis of medical problems, case studies.

#### Fields of study

#### Guarantors and lecturers

• Guarantors:	doc. Daniel Georgiev, PhD. (100%)
• Lecturer:	doc. Daniel Georgiev, PhD. (100%), Ing. Lucie Houdová, Ph.D. (100%), Ing. Miroslav Jiřík, Ph.D.
	(100%), Ing. Kateřina Wolf (100%)
• Tutorial lecturer:	Ing. Lucie Houdová, Ph.D. (100%)

- Literature
  - Recommended: Eck, Vladimír; Razím, Miroslav. *Biokybernetika*. Vyd. 1. Praha : Vydavatelství ČVUT, 1996. ISBN 80-01-01445-2.
    Recommended: Trojan, Stanislav. *Lékařská fyziologie*. Vyd. 4., přeprac. a dopl. Praha : Grada, 2003. ISBN 80-247-
    - (c) IS/STAG , Portal Course syllabus , 15.07.2025 22:51

# 0512-5.

# Bronzino, J.D. The biomedical engineering handbook. CRC Press, 2000.

## Time requirements

• Recommended:

All forms of study			
Activities	Time requirements for activity [h]		
Practical training (number of hours)		26	
Presentation preparation (report) (1-1	0)	10	
Contact hours		26	
Preparation for an examination (30-6	0)	54	
Preparation for laboratory testing; ou analysis (1-8)	tcome	4	
	Total:	120	

#### assessment methods

	Knowledge - kn	owledge achieved	l by taking this cours	e are verified by the	following means:
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Seminar work

Combined exam

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

Written exam

Seminar work

Individual presentation at a seminar

Skills demonstration during practicum

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

Combined exam

Seminar work

Skills demonstration during practicum

Individual presentation at a seminar

#### prerequisite

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

to understand the general human biology

to explain the rules of differential equations solving

to understand system analysis

to define the fundamental structures of control systems and approaches to control

to explain the fundamental principles of dynamic systems modeling and simulation

to understand methods of signal processing

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

to analyze the system characteristics of dynamical systems

to apply the results of analytical and experimental analysis

to elaborate behavioral requirements and features of regulation process, while respecting the constraints

to design mathematical models of real nonlinear dynamical systems (models for simulation tasks design)

to assess the principles of dynamic systems modeling

to perform basic signal analysis

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

N/A	
N/A	

#### teaching methods

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

Lecture

Practicum

Laboratory work

Self-study of literature

Field trip

Individual study

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

Interactive lecture

Task-based study method

Practicum

Discussion

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

Interactive lecture

Task-based study method

Self-study of literature

Individual study

Students' portfolio

#### learning outcomes

#### Knowledge - knowledge resulting from the course:

to comprehend the fundamental principles of biocybernetics

to understand the fundamental principles of neurophysiology, body locomotion, respiratory system, urinary system, electrophysiological principle of heart activity and blood circulation

to explain the methods of medical problem analysis

to explain the principles of physiological regulation

to describe the principles of biological systems modeling and use of special simulation techniques in biology

to describe the basic biocybernetical models used in practice

to describe the rules of measurement and processing of 1D biosignals

#### Skills - skills resulting from the course:

to analyze medical problems

to analyze and solve fundamental tasks of physiological / regulatory, population and epidemiological nature

to apply the correct principles in biocybernetical case studies

to choose suitable model of biological system

to independently establish a model of biological system

to validate model of biological system

to analyze and process EKG biosignal

competences - competences resuring nom me course.	Comp	etences -	competences	s resulting	from	the course:	
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N/A N/A 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 Computer Engineering	Bachelor	Full-time	Cybernetics and Control Engineering	1 2018	2023	Povinně volitelné předměty	В	2	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1 2019	2023	Povinně volitelné předměty	В	2	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1 2023	2023	Povinně volitelné předměty	В	2	LS