Course description

Department/Unit /	KKY / BIO			**Academic Year**	2023/2024
Title	Biocybernetics			**Type of completion**	Exam
Accredited/Credits	Yes, 4 Cred.			**Type of completion**	Written
Number of hours	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]				
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, Summer
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 case of a previous evaluation 4 nebo nic.				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended 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 80-247-0512-5.

- **Recommended:** Bronzino, J.D. *The biomedical engineering handbook*. CRC Press, 2000.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Practical training (number of hours)	26
Presentation preparation (report) (1-10)	10
Contact hours	26
Preparation for an examination (30-60)	54
Preparation for laboratory testing; outcome analysis (1-8)	4
Total:	**120**

assessment methods

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

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

N/A

N/A

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 resulting from the course:

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	B	2	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1	2019	2023	Povinně volitelné předměty	B	2	LS
Cybernetics and Control Engineering	Bachelor	Full-time	Artificial Intelligence and Automation	1	2023	2023	Povinně volitelné předměty	B	2	LS