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COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBF-223/00	Application Programs in Biophysics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): Introduction to the basics of numerical programming methods in biophysics, methods of control of experimental equipment, data acquisition and processing.

Learning outcomes:

Class syllabus:
Introduction to practical and effective methods of numerical and application programming needed to solve problems related to biophysics: solving linear algebraic equations, interpolation and extrapolation, fast Fourier transform, Fourier and spectral applications, statistical description of data. Programming of A/D converters. On-line control of experimental equipment. Collection and processing of data from experimental units.

Recommended literature:
C. Hill, Learning scientific programming with Python, 2nd edition, Cambridge University Press, 2020, ISBN 9781108778039; J.M. Zelle, Python programming:An introduction to computer science. Sherwood; Franklin, Beedle & Associates, 2010, ISBN 978-1887902991.
http://en.wikipedia.org/wiki/Object-oriented_programming
http://www.python.org/
http://www.scipy.org/

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 36

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Peter Rybár, PhD.

Last change: 11.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-215/15	Applications of Ionising Radiation and Radionuclides in Medicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Final exam: written
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Students will acquire basic knowledge about sources of ionizing radiation used in medicine, radiological imaging methods, use of radiation in diagnostics and therapy.

Class syllabus:
Interaction of radiation with matter. Radionuclide sources of neutrons, alpha, beta and gamma radiation. Low-energy sources of X-radiation. X-ray beam shaping. Isotope therapeutic sources. Medical accelerators: linear electron accelerators, betatrons, cyclotrons, microtrons. Physical principles of radionuclide production. Radionuclides in nuclear medicine. CT, SPECT and PET tomography. Radiological imaging methods. Methods of radiation therapy: proton, neutron, capture, pion and heavy ion therapy.

Recommended literature:
J.E. Martin: Physics for Radiation Protection, Wiley-VCH, 2000
W.L.Hendee,et al.: Radiation Therapy Physics, Wiley, 2005

Languages necessary to complete the course:
Slovak in combination with English (some of the suggested readings are in English).

Notes:

Past grade distribution
Total number of evaluated students: 56

A	B	C	D	E	FX
92,86	7,14	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Karol Holý, CSc., doc. RNDr. Radoslav Böhm, PhD., doc. RNDr. Monika Müllerová, PhD., RNDr. Terézia Eckertová, PhD.

Last change: 11.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-140/22	Bases of Biomechanics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
Explanation of the basic principles of biomechanics in the living system.

Class syllabus:
Subject and history of biomechanics. Cell membrane biomechanics and cell shape. Tissues as biomaterials. Distribution and mechanical properties of solid biomaterials. Liquid biomaterials. Newtonian and Maxwell fluids. Biomechanics of bones and joints. Musculoskeletal system - skeletal muscle system, joints, active movement of the joint, force on the skeletal elements, muscle energy and Hill's equation. Muscle work and muscle machine. Deformation and elastic properties of blood vessels. Analysis of blood velocity in blood vessels - laws of hemodynamics. Mechanical work of the heart. Biomechanics of hearing. Ear resonator system, hydrodynamic. sound transmission and hearing theory. Respiratory mechanics. Breathing resistances and breathing work. Respiratory gas transport. Bohr's equation for the calculation of anatomical dead space. Biophysical aspects of lung cleansing mechanisms.

Recommended literature:
Biophysics : An introduction / Roland Glaser. Heidelberg : Springer, 2012

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 136

A	B	C	D	E	FX
88,97	6,62	2,94	1,47	0,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc.

Last change: 11.01.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-124/00	Basic Applications of Optical Spectrometry

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: laboratory task, test
Final examination: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
After completing the course, students will be able to apply optical spectroscopy theoretically and experimentally in research and practice, especially in the fields of biophysics, medicine and biochemistry.

Class syllabus:
Electromagnetic radiation spectrum. Energetic states (levels) of molecules. Electronic transitions in molecules. Probabilities of absorption and emission, Einstein coefficients. Transition dipole moments. Absorption of UV VIS radiation, Lambert-Bear-Bouguer law. Information contained in absorption spectra, Frank-Condon principle. Techniques of absorption spectrophotometry. Preparation of samples for optical spectrophotometry. Chromophores. Effect of internal factors on absorption spectra. Effect of external factors on absorption spectra. Absorption of linearly polarized light. Applications of absorption spectroscopy. Fundamentals of formation of excited electronic states of molecules. Information contained in fluorescence spectra. Techniques of spectroflourimetry. Properties of electronically excited molecules. Effect of internal factors on fluorescence spectra. Stokes law, law of mirror symmetry. Quantum yield of fluorescence. Kinetics of luminiscence, lifetime of excited state. Fluorophores. Effect of external factors on fluorescence spectra. Fluorescence quenching, fluorescence anisotropy. Fluorescence probes and labels.

Recommended literature:
Kováč Š., Leško I., Spektrálne metódy v organickej chémii. Alfa, Bratislava 1980
Ferenčík M., Škárka B., a kol.: Biochemické laboratórne metódy. Alfa, Bratislava 1981
Lapčík Ľ., Pelikán P., Čeppan M.: Fotochemické procesy. Alfa, Bratislava 1989
Prosser V. a kol.: Experimentální metody biofyziky. Academia, Praha 1989

Laser-Tissue Interactions : Fundamentals and Applications / Markolf H. Niemz. Berlin : Springer, 2004
Spectroscopy for the biological sciences / Gordon G. Hammes. Hoboken, N.J. : Wiley, 2005iences / Gordon G. Hammes. Hoboken, N.J. : Wiley, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 141

A	B	C	D	E	FX
86,52	8,51	2,13	1,42	0,71	0,71

Lecturers: prof. RNDr. Libuša Šikurová, CSc., RNDr. Marcela Morvová, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-121/00	Basics of MR Spektrometry and Tomography

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
General principles of imaging in medical practice. Basic concepts and physical principles of NMR and EPR. NMR spectrum. Relaxation mechanisms. Relationship between high resolution NMR spectrum parameters and compound structure. Multi-pulse NMR spectroscopy. 2D NMR spectroscopy. Principle of NMR imaging. Image parameters and contrast. Special imaging techniques, artifacts. Hardware and specific requirements for in-vivo measurements in humans. Localized spectroscopy and spectroscopic imaging (CSI). Practical demonstration of MR imaging and localized spectroscopy.

Recommended literature:
Literatúra dostupná voľne na webe napr.:
Webb, A.: CHAPTER 1: The principles of Magnetic Resonance, and Associated Hardware, in Magnetic Resonance Technology: Hardware and System Component Design, 2016, pp. 1-47. doi: 10.1039/9781782623878-00001 eISBN: 978-1-78262-387-8

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 167

A	B	C	D	E	FX
65,87	20,36	8,98	0,6	2,99	1,2

Lecturers: Ing. Vladimír Mlynárik, DrSc.

Last change: 18.02.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-128/19	Bioelectrochemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: individual work
Final examination: oral exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Gain knowledge about bioelectrochemical processes, the behavior of biomolecules on charged surfaces, the possibilities of electrochemical detection of medically important molecules, the principles of operation of electrochemical biosensors as well as electrochemical principles in bioenergetics.

Class syllabus:
Definition of basic terms in bioelectrochemistry. Phase interfaces, electrical bilayer
Basic electrochemical methods (potentiostatic, galvanostatic and impedance). Interactions of biomolecules with surfaces. Electroanalysis of biopolymers (nucleic acids, proteins, glycans, ..), their structural changes and intermolecular interactions. Basic principles of biosensors operation. Glucose biosensors. Electrochemical applications in medicine. Bioelectrocatalysis, biofuel cells and biocapacitors. Bioenergy.

Recommended literature:
BARD, A. FAULKNER, L. Electrochemical Methods: Fundamentals and Applications, 2nd Edition. New York: John Wiley and Sons, Inc., 2001. 833 s. ISBN 0 471 04372 9.
WANG, J., Analytical electrochemistry. Wiley-VCH: New York, 2001, ISBN: 978-0-471-67879-3
VACEK, J. OSTATNÁ, Bioelektrochemie: Nové směry v elektrochemii biologicky významných molekul, Univerzita Palackého v Olomouci, 2020. ISBN 978-244-5763-5.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Veronika Ostatná, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-114/22	Biomedical Applications of Ultrasound

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
By completing the course, the student acquires a knowledge on the application of ultrasound in medical diagnostics.

Class syllabus:
Mechanisms of acoustic wave propagation in the environment. Relation of acoustic wave propagation velocity with density and environmental compressibility. Piezoelectric effect. Pulse and resonance method for measurement of velocity and absorption of ultrasound. Acoustic biosensors. Ultrasound velocimetry. Ultrasound spectrometry. Acoustic impedance. Surface acoustic waves. Application of acoustics in biophysics and medicine. Diagnostics by ultrasound. Therapeutic ultrasound.

Recommended literature:
P.R. Hoskins, K. Martin, A. Thrush (Eds.) Diagnostic ultrasound, 2nd edition, Cambridge University Press, 2010, ISBN 9780511750885; B. Nölting, Methods in modern biophysics, Berlin, Springer, 2006, ISBN 978-3-540-27704-0; D.S. Ballantine, Jr. et al. Acoustic wave sensors: Theory, design, and physico-chemical applications, San Diego : Academic Press, 1997, ISBN 0-12-077460-7.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 12

A	B	C	D	E	FX
91,67	0,0	0,0	0,0	0,0	8,33

Lecturers: Mgr. Marek Tatarko, PhD., prof. RNDr. Tibor Hianik, DrSc.

Last change: 04.02.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBF-143/15	Biosensors and Nanotechnologies

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Recommended prerequisites:
,

Antirequisites: FMFI.KJFB/2-FBF-143/00

Course requirements:
P: semester work and its presentation
Z: test and oral examination (80/20)
Grade scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
By completing the course, the student acquires some knowledge about nanotechnologies, principles of construction and function of biosensors and their applications in biophysics, chemical physics and biomedicine.

Class syllabus:
Definition and characteristics of the biosensor. Sensitive biological elements. Methods of immobilization of biological components on various surfaces. Nanotechnologies, methods of surface modification with nanomaterials. Electrochemical biosensors. Optical biosensors. Mass biosensors and thermal biosensors. Applications of biosensors. Methods of studying surfaces using atomic force microscopy (AFM) and atomic force spectroscopy.

Recommended literature:
Biological Imaging and Sensing / T. Furukawa (Ed.). Berlin: Springer, 2004; Chemical sensors and biosensors: Fundamentals and applications / Florinel-Gabriel Banica. Chichester: John Wiley, 2012; Introduction to biosensors: From electric circuits to immunosensors / Jeong-Yeol Yoon. New York: Springer, 2013; Surface-launched acoustic wave sensors: Chemical sensing and thin-film characterization / Michael Thompson and David C. Stone. New York: Wiley Interscience, 1997; Physicochemistry and hydrodynamics of Langmuir-Blodgett depositions: Influence of molecular level forces on the efficiency of deposition of perfectly ordered Langmuir nanofilms / M. Elena Diaz and Ramon L. Cerro. Saarbrücken : VDM Verlag Dr. Müller, 2008; Nanobiotechnology: Concepts, applications and perspectives / edited by Christof M. Niemeyer and Chad A. Mirkin. Weinheim: Wiley-VCH, 2004; The aptamer handbook: Functional

oligonucleotides and their applications / edited by Sven Klussmann. Weinheim: Wiley-VCH, 2006.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 65

A	B	C	D	E	FX
73,85	20,0	6,15	0,0	0,0	0,0

Lecturers: prof. RNDr. Tibor Hianik, DrSc., Mgr. Veronika Šubjaková, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-206/22	Design of Experiments and Studies in Biomedical Research

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 1 **per level/semester:** 26 / 13
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
-

Antirequisites: FMFI.KJFB/2-FBM-206/00

Course requirements:
Preliminary evaluation: presenting homeworks
Final exam: oral / written written and oral exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Upon completion, students are familiar with the general principles of scientific research, types of experimental and study designs in interdisciplinary biophysical and biomedical research, and statistical and analytical tools. In simulated research situations and by using active teaching and learning methods, students will learn to work in teams and apply the acquired knowledge in exemplary basic situations from formulating a working hypothesis, methodological scheme, through data collection and processing and interpretation of results in the context of research issues and research questions. Students will gain skills in operating analytical program systems. At the same time they train in the so-called soft skills (communication, argumentation and presentation of teamwork results).

Class syllabus:
Introduction to the problematics, an overview of basic research hypotheses as well as of experimental and clinical designs. Experimental planning (studies), formulation of working hypothesis, choice and character of factors (inputs), levels of factors, interactions, definition and measurement of response (outcome), sources of variability. Structure and organization of individual experiments, conditions for performing the experiment/study, methods for increasing the accuracy and reliability of the results (sample size, randomization, stratification). Analysis of variance in different experimental settings. Introduction to multivariate approaches. Simulated research situations: Description and analysis of the data set in simulated results, descriptive statistics, testing hypotheses about differences, testing bioequivalence, testing hypotheses about relationships,

performance analysis of diagnostic tests. Graphical, tabular and textual presentation of results. Interpretation of results and formulation of research conclusions. The most common mistakes and shortcomings in biomedical research.

Recommended literature:

Somorčík, J., Teplička, I. (2015). Štatistika zrozumiteľne. Bratislava : Enigma, 1. vydanie, 2015, 244 s. ISBN 9788081330421.
Základy statistiky pro biomedicínské obory / Jana Zvárová. Praha : Karolinum, 2011
Pekár, S. a Brabec, M. (2009). Moderní analýza biologických dat 1. Zobecněné lineární modely v prostředí R. Praha : Scientia, 1. vydanie, 2009, 225 s. ISBN 978-80-86960-44-9.
Pekár, S. a Brabec, M. (2012). Moderní analýza biologických dat 2. Lineární modely s korelacemi v prostředí R. Brno : Masarykova univerzita, 1. vydanie, 2009, 225 s. ISBN 978-80-210-5812-5.
Waczulíková, I., Slezák, P. (2015). Introductory Biostatistics. Bratislava: Comenius University, 1st Edition, 2015, 147 p. ISBN 978-80-223-3938-4.
Motulsky, H. (2014). Intuitive Biostatistics. New York : Oxford University Press, 3rd Edition, 2014, 540 p. ISBN 987-0-19-994664-8.
H.J. Motulsky and A Christopoulos, Fitting models to biological data using linear and nonlinear regression. A practical guide to curve fitting. 2004, Oxford University Press Inc., New York, 351 pages
Thomas A. Lang, Michelle Secic. How to report statistics in medicine : Annotated guidelines for authors, editors, and reviewers. Philadelphia : American College of Physicians, 1997

Languages necessary to complete the course:

Slovak in combination with English (some of the suggested readings are in English)

Notes:

-

Past grade distribution

Total number of evaluated students: 131

A	B	C	D	E	FX
81,68	14,5	3,82	0,0	0,0	0,0

Lecturers: doc. RNDr. Iveta Waczulíková, PhD.

Last change: 09.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-910/00	Diploma Thesis (1)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: individual work evaluated by the supervisor and subsequently by the persons responsible for the study programme
Final examination: based on the status of the diploma thesis
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to obtain the necessary scientific information from the literature, analysis and synthesis of information. They will also be able to work with specific methods and devices according to the diploma thesis.

Class syllabus:
Preparation of literature survey on the basis of assigned subject of diploma theses aims determination, preparation of materials for selection of the methodic procedure for solution of the subject.

Recommended literature:
According to the diploma theses.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 143

A	B	C	D	E	FX
95,8	4,2	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-912/15	Diploma Thesis (2)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 6 **per level/semester:** 78
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: individual work
Final examination: submission of diploma thesis
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to obtain and discuss their own results and process them in writing.

Class syllabus:
Obtaining own results, their discussion, applications.

Recommended literature:
Statistical Methods in Medical Research / P. Armitage, G. Berry, J.N.S. Matthews. Malden, Mass. : Blackwell Science, 2002
How to report statistics in medicine : Annotated guidelines for authors, editors, and reviewers / Thomas A. Lang, Michelle Secic. Philadelphia : American College of Physicians, 1997
Základy statistiky pro biomedicínské obory / Jana Zvárová. Praha : Karolinum, 2011
Výber aktuálnych článkov z oblasti diplomovej práce

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 145

A	B	C	D	E	FX
98,62	0,69	0,69	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-991/15	**Course title:** Diploma Thesis Defense
Number of credits: 10	
Educational level: II.	
Course requirements: Exam: Diploma thesis defense Scale of assessment (preliminary/final): 0/100	
Learning outcomes: After completing the course, students will be able to present, defend and discuss their own results in the field of biomedical physics.	
Class syllabus: Presentation, defense and discussion of own results in the field of biomedical physics.	
State exam syllabus:	
Recommended literature: Introduction to physics in modern medicine / Suzanne Amador Kane. Abingdon : Taylor & Francis, 2003 Statistical Methods in Medical Research / P. Armitage, G. Berry, J.N.S. Matthews. Malden, Mass. : Blackwell Science, 2002 Biomedical signal image processing / Kayyvan Najarian, Robert Splinter. Boca Raton, Fla. : Taylor & Francis, 2006	
Languages necessary to complete the course: Slovak, English	
Last change: 14.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-920/22	Diploma Thesis Seminar (1)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: individual presentation, discussion
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:

Class syllabus:
Presentation of information from literature and suggestion of topics for the Diploma thesis. Presentation and discussion of techniques and methods (experimental and theoretical) to be used in the thesis. Presentation of results with statistics, discussion.

Recommended literature:
According to the Diploma thesis

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 140

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-921/22	Diploma Thesis Seminar (2)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: individual presentation, discussion
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:

Class syllabus:
Presentation of own results with statistics, discussion.

Recommended literature:
According to the Diploma thesis

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 145

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚLFBIT/2-FBM-231/00	EMG Methods in Diagnostics and Therapy

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Anatomical and physiological bases of bioelectromagnetism. Bioelectric sources, conductors and their modeling. Theoretical methods in bioelectromagnetism. Electrical and magnetic measurements of electrical activity of nervous tissues and heart. Electrical and magnetic stimulation of nervous tissues and heart. Measurement of internal electrical properties of biological tissues. Other bioelectromagnetic manifestations. Principles of electrical and magnetic treatment methods. Safety and health protection during registration and application of electrical and magnetic signals (microshock, macroshock).

Recommended literature:
Davidovits, P.,: Physics in biology and medicine. Academic Press/Elsevier, London, 5th ed., 2019. ISBN 978-0-12-81371.
MACFARLANE, P.W., OOSTEROM, A., PAHLM, O., KLIGFIELD, P., JANSE, M., CAMM, J. (Eds.): Comprehensive Electrocardiology. London: Springer, 2nd edition, Vol. 4, p. 2308. 2010. ISBN: 978-1-84882-045-6 – vybrané kapitoly.
MALMIVUO, J., PLONSEY, R.: Bioelectromagnetism - Principles and Applications of Bioelectric and Biomagnetic Fields. New York - Oxford: Oxford University Press, p. 641. 1995. ISBN: 978-0-19-505823-9 – vybrané kapitoly (https://www.bem.fi/book/bem.fi).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 33

A	B	C	D	E	FX
66,67	18,18	15,15	0,0	0,0	0,0

Lecturers: doc. RNDr. Mgr. Katarína Kozlíková, CSc.
Last change: 28.01.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-117/22	Effects of Ionizing Radiation on Living Organism and Radiation Protection

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: project
Final evaluation: exam

Learning outcomes:
Gaining knowledge about the mechanisms of ionizing radiation at the level of cells, tissues and organs and getting acquainted with the basic principles of radiation protection.

Class syllabus:
Ionizing radiation. Interaction of particles in the material environment. Effects of ionizing radiation at the level of cells, tissues and organs. Contamination by radioactive substances. Characteristics of clinical changes after irradiation. Repair of radiation damage. Radioprotective substances. Radiation monitoring and personal dosimetry. Radiation accidents and incidents. Care for persons irradiated with ionizing radiation. National regulations and international recommendations for protection against ionizing radiation.

Recommended literature:
E. B. Podgoršak: Radiation physics for medical physicists, Heidelberg, 2010.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 11

A	B	C	D	E	FX
54,55	9,09	9,09	9,09	18,18	0,0

Lecturers: Mgr. Katarína Čechová, PhD.

Last change: 10.01.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 95

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 95

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-233/13	English Conversation Course (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational English as well as English for specific purposes appropriate for university students. This course is a follow up of the previously taught ESP course.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge.

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 263

A	B	C	D	E	FX
72,62	10,65	5,32	1,52	1,14	8,75

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-234/13	English Conversation Course (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, oral presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational/spoken English as well as English for specific purpose appropriate for university students. This course is a follow up of the Conversational English course 1.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge(Upper-Intermediate/Lower Advanced).

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 187

A	B	C	D	E	FX
81,28	9,63	2,67	1,07	0,0	5,35

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-103/22	Experimental Methods in Medical Physics (1)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Final examination: oral exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Upon completion, the student will gain knowledge of the principles, basic schemes and applications of experimental physical methods in medical practice and research.

Class syllabus:
Introduction to laboratory methods (handling of chemicals, preparation of solutions, pH measurement), separation methods of biological samples (electrophoresis, centrifugation, distillation, extraction), introduction to chromatographic methods (paper, thin film, ion exchange , gel, affinity, capillary, gas, HPLC, supercritical), flow cytometry, microscopic techniques (light microscopy, dark field microscopy, phase contrast, polarized microscopy, electron microscopy - SEM, TEM, fluorescence and confocal microscopy), polymerase chain reaction, spectroscopic methods (UV/VIS, fluorescence, circular dichroism, mass, Raman, infrared spectroscopy), ultrasound

Recommended literature:
Introduction to physics in modern medicine / Suzanne Amador Kane. Abingdon: Taylor & Francis, 2003
Biomedical devices and their applications / D. Shi (Ed.). Berlin: Springer, 2004
Methods in modern biophysics / Bengt Nölting. Berlin: Springer, 2006
Introduction to experimental biophysics: Biological methods for physical scientists / Jay Nadeau. Boca Raton: CRC Press, 2012
Biomedical applications of introductory physics / Jack A. Tuszynski, John M. Dixon. Hoboken, N.J.: Wiley, 2002

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 152

A	B	C	D	E	FX
67,11	25,66	5,26	1,32	0,0	0,66

Lecturers: RNDr. Milan Zvarík, PhD., doc. RNDr. Iveta Waczulíková, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-104/00	Experimental Methods in Medical Physics (2)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Final examination: oral exam
Continuous assessment: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The student 1) will understand the physical principles of methods and devices standardly used in medical practice and / or research, 2) will be able to correctly analyze and interpret the results obtained with respect to experimental conditions or clinical characteristics.

Class syllabus:
Force microscopes, methods using static and dynamic scattering on colloids (suspensions), stem cells, methods using classical (equilibrium) thermodynamics in the study of biological systems, basics of dosimetry and radiation protection, imaging methods in medicine, radiotherapy, simulation medicine, methods for development drugs and monitoring their distribution in the body, thin films and interfaces, colloids, emulsions and gels, membrane lipid systems, rheology of biological fluids.

Recommended literature:
Introduction to physics in modern medicine / Suzanne Amador Kane. Abingdon : Taylor & Francis, 2003
Biomedical devices and their applications / D. Shi (Ed.). Berlin: Springer, 2004
Methods in modern biophysics / Bengt Nölting. Berlin: Springer, 2006
Introduction to experimental biophysics: Biological methods for physical scientists / Jay Nadeau. Boca Raton: CRC Press, 2012
Biomedical applications of introductory physics / Jack A. Tuszynski, John M. Dixon. Hoboken, N.J.: Wiley, 2002

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 150					
A	B	C	D	E	FX
62,0	30,0	6,67	1,33	0,0	0,0
Lecturers: Mgr. Katarína Čechová, PhD., doc. RNDr. Pavol Vitovič, PhD.					
Last change: 14.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-127/19	Experimental Methods in Practice

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary evaluation: Active participation and semestral projects
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Upon completion, the student gets an overview and practical experience with the applications of experimental physical methods in medical practice and research.

Class syllabus:
During the semester, we visit several laboratories: high-performance liquid chromatography, flow cytometry, microbiology and virology, confocal microscopy, electron microscopy, laboratories of the Slovak Academy of Sciences, laboratories of the laser center and selected clinical institutes.

Recommended literature:
Introduction to Experimental Biophysics Biological Mehods for Physical Scientists / Jay L. Nadeau. Boca Raton, Florida: CRP Press, 2018
Methods of Experimental Physics / G. Ehrenstein, H. Lecar (Ed.). London: Academic Press, 1982
Methods in Molecular Biophysics – Structure, Dynamics, Function / Igor N. Serdyuk, Nathan R. Zaccai, Joseph Zaccai. New York: Cambridge University Press, 2007

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 21

A	B	C	D	E	FX
95,24	0,0	0,0	0,0	0,0	4,76

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-216/22	Field Practice

Educational activities:
Type of activities: practice
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary evaluation: >80% attendance
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will consolidate their theoretical knowledge through practical experience comprising the student will consolidate theoretical and learn to apply this knowledge to practice in the field of study. They will learn to control instrumentation and operating software.They learn to work in a team, to communicate effectively and to take responsibility. They are trained in the soft skills (communication, argumentation and interpretation of teamwork results).

Class syllabus:
Communication with director or head of the department as well as with the subject guarantor. Familiarization with the content of the Student Inteernship Agreement and with the conditions of professional practice and liability for damage. Completion of necessary health and safety training. Getting acquainted with the infrastructure of the workplace, training in the operation of selected instrumentation and software.

Recommended literature:
§ 51 of Act. no. 40/1964 Coll. The Civil Code as amended (hereinafter referred to as the "Civil Code") and the Decree of the Ministry of Health of the Slovak Republic no. 84/2016 Z.z. laying down the defining characteristics of individual types of medical facilities.
Zamestnávanie zdravotníckych pracovníkov / Lenka Freel - 1. vyd. – Bratislava : Univerzita Komenského, Právnická fakulta, 2020., - 99 s. ISBN: 978 – 80 – 7160 – 553 – 9
Biomedical research legislation:
- Regulation of the Government of the Slovak Republic no. 377/2012 Z. z. laying down requirements for the protection of animals used for scientific or educational purposes, similar to Act 39/2007 Coll. on veterinary care,
- Act No. 576/2004 on health care and on services related to health care, and Additional Protocol to the Convention on Human Rights and Biomedicine concerning Biomedical Research, ratified on 2007,

- Declaration of Helsinki (Ethical Principles of Human Participation Research), Protection of Personality and Medical Law, Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine, Convention on Human Rights and Biomedicine etc.
Legislation and documents of World Medical Association Declaration of Helsinki, ethical principles for medical research involving human subjects

Languages necessary to complete the course:
Slovak in combination with English (some of the suggested readings are in English)

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Iveta Waczulíková, PhD.

Last change: 12.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-141/00	French Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
French language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of French.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 469

A	B	C	D	E	FX
47,97	19,4	17,48	8,32	2,13	4,69

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-142/00	French Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject continues the program of French language (1) and provides courses of essential and intermediate French language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 292

A	B	C	D	E	FX
44,18	22,95	17,81	9,25	2,4	3,42

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-241/00	French Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French language, covering not only general, but also technical language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 112

A	B	C	D	E	FX
42,86	26,79	19,64	6,25	0,89	3,57

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-242/00	French Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French covering not only general, but also technical French language.

Recommended literature:
Menand Robert: Le Nouveau taxi 2, Hachette FLE, Paris, France 2009, ISBN 978-2-01-155551 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 76

A	B	C	D	E	FX
43,42	31,58	17,11	2,63	1,32	3,95

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-151/00	German Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at three levels: beginner, intermediate and advanced. Students opt for one of them depending on whether they need to learn the fundamentals or maintain and/or improve their previous knowledge.
This course's focus is to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 795

A	B	C	D	E	FX
38,11	25,66	18,74	8,93	2,64	5,91

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-152/00	German Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of German.
This course's focus is to to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 511

A	B	C	D	E	FX
38,55	19,57	19,96	12,33	3,33	6,26

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-251/00	German Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1,2). The subject provides a course of intermediate or advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 176

A	B	C	D	E	FX
43,75	23,86	19,89	6,82	2,27	3,41

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-252/00	German Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1-3). It provides a course of intermediate and advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 97

A	B	C	D	E	FX
45,36	22,68	12,37	11,34	3,09	5,15

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-111/15	Informatics for Health and Medicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KJFB/2-FBM-111/00

Course requirements:
Preliminary evaluation: Active participation, semestral project
Final exam: test
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students will be able to work witth basic current information and management technologies used in the medical environment - with computer science, health and management basics of health and medical informatics and e-Health system.

Class syllabus:
Introduction to health and medical informatics. Healthcare organization. National Health and Administrative Registers. Informatization of society (information society). Information systems and technologies - hospital, ambulance, management of medical facilities, laboratories, examinations, pharmacies. Modern technical equipment of medicine. Industry 4.0, cyber-physical systems, Big Data, Cloud Computing, exponential technologies, augmented and virtual reality in medicine. Open data in medical research. Electronic healthcare implementation program, e-Health, electronic medical record, electronic signature, GDPR. Telemedicine. The human body - a source of biophysical, visual and acoustic information. Visible Human Project, Human Genome Project. News in medical informatics.

Recommended literature:
Biomedicínska informatika - Jana Zvárová a kolektív, Karolinum, I. diel (2002), II. diel (2006), III. diel (2009), IV. diel (2010), V. diel (2013)
Medical Informatics, e-Health, Funfamentals and Applications, Editors: Alain Venot, Anita Burgum, Catherina Quantin, Springer (2014)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 151

A	B	C	D	E	FX
66,89	21,85	9,27	1,32	0,66	0,0

Lecturers: Mgr. Katarína Čechová, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI+KAI/2-MXX-131/21	International Team-based Research Project

Educational activities:
Type of activities: course / independent work
Number of hours:
per week: 3 **per level/semester:** 39 / 30s
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: active participation in research in an international student team (25%), presentation of work in a workshop (25%), scientific article (50%)
Indicative evaluation scale: A 90 %, B 80 %, C 70 %, D 60 %, E 50 %
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will learn in the team to agree on a common research topic, formulate research questions, determine research methods for the problem, collect and evaluate data, discuss their findings, present research results to the professional public, analyze and evaluate the scientific work of their colleagues, prepare a scientific article suitable for publication

Class syllabus:
- Research methodology
- Design and implementation of a research project in an international group (preferably interdisciplinary)
- Methods and tools for collaboration in virtual space, collaboration in science and practice
- Academic writing, presentation of research results through scientific articles; objectives, content and structure of scientific articles; forms of academic publication, publication forums and evaluation of their quality
- Quality assurance and feedback - peer review
- Communication of results through posters or conference presentations

Recommended literature:
- Teachers' own electronic study materials published on the course website or in the Moodle system
- Gavora, Peter a kol. 2010. Elektronická učebnica pedagogického výskumu. [online]. Bratislava : Univerzita Komenského, 2010. Dostupné na: http://www.e-metodologia.fedu.uniba.sk/ ISBN 978–80–223–2951–4.

- Tharenou, P., Donohue, R. and Cooper, B., 2007. Management research methods. Cambridge University Press.
- Topping, A., 2015: The Quantitative-Qualitative Continium. In: Gerrish, K. and Lathlean, J., The Research Process in Nursing, p. 159-172
- Williamson, K. and Johanson, G. eds., 2017. Research methods: Information, systems, and contexts. Chandos Publishing.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
66,67	0,0	0,0	0,0	33,33	0,0

Lecturers: doc. RNDr. Zuzana Kubincová, PhD., doc. RNDr. Martin Homola, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-214/15	Introduction to Dosimetry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KJFB/2-FJF-108/00

Course requirements:
Final exam: oral / written
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The students will gain knowledge of basic dosimetric quantities, methods of measuring activity and dose, integral methods of dosimetry, biological effects of ionizing radiation and principles of radiation protection.

Class syllabus:
The subject and place of dosimetry. Basic dosimetric quantities and relationships between them. Classification of dosimetric quantities and methods. Absolute methods for measuring activity and dose. Radiative equilibrium, Fano's theorem. Bragg-Gray theory of ionization in a cavity. Ionization methods of dosimetry. Tissue equivalence, energy dependence of dosimeters. Integral dosimetry methods, film and thermoluminescence dosimeters, track detectors. Perspectives of using other principles of dosimetry. Effect of radiation on man, cell damage, tissue radiosensitivity, reparation mechanism, stochastic and non-stochastic effects, dose-effect relationship. Principles of radiation protection.

Recommended literature:
Introduction to Radiological Physics and Radiation Dosimetry / Frank Herbert Attix. Weinheim : Wiley-VCH , 2004
J. Šeda a kol.:Dozimetrie ionizujícího záření, SNTL Praha, 1983
J.E.Turner: Atoms, Radiation and Radiation Protection,WILEY-VCH, 2004

Languages necessary to complete the course:
Slovak in combination with English (some of the suggested readings are in English).

Notes:

Past grade distribution Total number of evaluated students: 36					
A	B	C	D	E	FX
91,67	8,33	0,0	0,0	0,0	0,0
Lecturers: doc. RNDr. Karol Holý, CSc., doc. RNDr. Radoslav Böhm, PhD.					
Last change: 11.03.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-150/22	Introduction to General Biology

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KJFB/2-FBF-150/10

Course requirements:
Preliminary examination: test
Final examination: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Introduction to the general biology of cells and organisms.

Class syllabus:
1. Organization of living systems. Hierarchical systems. Non-cellular, single-celled and multicellular organisms.
2. Cell theory and chemical structure of the cell. Viruses. Prokaryotic and eukaryotic and cell.
3. Internal cell organization and construction principles: membrane, cytoskeletal and memory principle of functional cell organization. Structure and function of individual compartments.
4. Influence of external factors on cell structures.
5. Cell reproduction and cell cycle.
6. Vertical transmission of genetic information and types of reproduction.
7. Gene determination of multicellular organism traits. Basic genetic concepts.
8. Mendel's laws of inheritance. Autosomal and gonosomal inheritance.
9. Human genetics and population genetics.
10. Basic ecological concepts. Abiotic and biotic environmental factors.
11. Ecosystems and regulation in the ecosystem.
12. Mechanisms of evolution of living systems and human development.

Recommended literature:
Základy buněčné biologie : úvod do molekulární biologie buňky / Bruce Alberts ... [et al.]. Ústí nad Labem : Espero Publ., [2001]
Molecular and cellular biophysics / Jack A. Tuszynski. Boca Raton : Chapman & Hall/CRC, 2008

Essential cell biology / Bruce Alberts ... [et al.]. New York : Garland Science, 2004
Physics in biology and medicine / Paul Davidovits. San Diego : Harcourt Academic Press, 2001

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
87,5	12,5	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-112/15	Mathematical-physical Analyses of Measurements in Medicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: test
Final examination: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students will be able to assess what criteria must meet the statement in order to be considered a verified or plausible fact. Can identify fundamental errors in the presentation of medical knowledge in scientific publications and the mass media. He knows the basic problems of clinical research and epidemiological studies, understands the basic limits of experimental methods and knows where to look for critical points of scientific publication. He verified these skills on a separate analysis of at least two papers from the available literature.

Class syllabus:
Zdrojový text
1 408 / 5 000
Výsledky překladu
1. Introduction: Basic model for medical diagnostics and selected topics from probability. (diagnostic test efficiency, binomial distribution - Bayesian probability, a priori and a posteriori probabilities). 2. The case of Sally Clark: Which probabilities are and which are not relevant. Principles of induction, P (data
H0) ≠ P (H0
data). The most common errors in probabilistic and statistical reasoning. 2. Therapy: results of an intervention in an indeterminate initial state. Measurement of therapy results. James-Stein and hidden variables. To vaccinate or not to vaccinate. Cost-benefit analysis: how the patient counts, how the doctor and how the insurance company. 4. Selected diagnostic methods: Radiodiagnostics (electromagnetic radiation detectors - dynamic range and noise depending on intensity and exposure time - mammography, and again cost-benefit analysis), biochemical diagnostic tests (minimum detectable concentrations - specificity). 6. Evidence base of medicine. What is verified and what is not. Cochrane collaboration. How to read a scientific paper. How to read an article on healthy

eating. Measured, perceived and presented effects and risks. This is not a lecture on biostatistics. The student is required to have a basic knowledge of probability theory and practical statistics and the ability to read scientific papers in English. Each student will receive two texts from the professional and daily press for their independent study and will present their findings at a designated lecture.

Recommended literature:

Data a znalosti v biomedicíně a zdravotnictví / editoři Jana Zvárová, Lenka Lhotská, Vladimír Přibík. Praha : Karolinum, 2010
Visualization in medicine : theory, algorithms, and applications / Bernhard Preim, Dirk Bartz. Burlington, Mass. : Morgan Kaufmann, 2007
Introduction to physics in modern medicine / Suzanne Amador Kane. Abingdon : Taylor & Francis, 2003
Biomedical signal image processing / Kayyvan Najarian, Robert Splinter. Boca Raton, Fla. : Taylor & Francis, 2006
Mathematical biology : 2. : Spatial models and biomedical applications / J. D. Murray. New York : Springer, 2003

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 68

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Peter Kvasnička

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-113/22	Medical Biophysics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Cytoskeletal biophysics, cell division, intercellular connections and diseases arising from damage. Types of proteins with a focus on ion channels (IK). Sodium IK and their diseases. Calcium IK and their diseases. Potassium IK and their diseases. Chlorine IK, their diseases and an overview of voltage-dependent IK. Receptors, receptor-regulated channels and their diseases. IK and cytoskeleton. IK, regulated from the cytoplasmic region, intracellular signaling. Small proteins (hormones, neurotransmitters, local mediators). Other proteins, transporters, pumps. Protein disease research. Drugs, toxins.

Recommended literature:
T. Hianik, Structure and physical properties of biomembranes and model membranes. Acta Physica Slovaca, 2006, vol. 56, No. 6, 687-805;
P.F. Dillon, Biophysics: a physiological approach, Cambridge University Press, 2012;

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Zuzana Garaiová, PhD.

Last change: 11.01.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-952/22	**Course title:** Medical Biophysics
Number of credits: 2	
Educational level: II.	
Course requirements: oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The student will repeat the theoretical and experimental methods of medical biophysics will gain the necessary overview.	
Class syllabus: 1. Structure and function of biopolymers, characteristic types of bonds, polymerization as a chemical process, types of biopolymers 2. Structure, physical properties and function of nucleic acids, genetic code, gene, information transfer 3. Structure, physical properties and function of proteins, peptide bond, types of protein structures 4. Structure, physical properties and function of glycans 5. Principles of cell structural organization, types of organelles and their importance, cell locomotor system, cell growth and division 6. Cell division, intercellular connections, necrosis, apoptosis, excessive cell proliferation (cancer) 7. Membrane biophysics, lipid bilayer, phase transitions, membrane models, role of lipids and proteins in the membrane 8. Passive transport of substances across membranes 9. Active transport of substances across membranes 10. Protein-lipid interactions, ion channels, exchangers, membrane receptors 11. Electrical properties of cells. Rest potential. 12. Physics of nerve impulse, structure of nerve cell, formation of action potential, Hodgkin-Huxley model 13. Synaptic transmission in the neuromuscular junction and in the central nervous system. 14. Molecular mechanisms of memory and learning 15. Muscle contraction, muscle structure, muscle proteins, biophysics of muscle contraction, mechanochemical coupling, basics of muscle regulation 16. Electrical activity of skeletal muscle cells and heart muscle. 17. Cell bioenergetics, mechanisms of membrane phosphorylation 18. Influence of physical factors on biosystems, influence of ionizing and non-ionizing radiation mechanisms 19. Photosynthesis of plants and bacteria 20. Photoreception, mechanisms of vertebrate and invertebrate vision	
State exam syllabus:	
Recommended literature:	

M. B. Jackson: Molecular and cellular biophysics. Cambridge. Cambridge University Press, 2006
D. G. Nicholls, S. J. Ferguson: Bioenergetics 4th edition. London : Academic Press, 2013
D. Uhríková a kol.: Biofyzika - Vybrané kapitoly, Učebnica pre vysoké školy, Univerzita Komenského v Bratislave, 2015
P. F. Dillon, Biophysics: A physiological approach, Cambridge University Press, 2012;
B. Alberts et al., Základy buněčné biologie: Úvod do molekulární biologie buňky. Espero Publishing, 2001

Languages necessary to complete the course:
Slovak, English

Last change: 17.04.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
PriF-FMFI.KI/2-AIN-501/00	Methods in Bioinformatics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAI+KI/1-BIN-301/15

Course requirements:
Homework assignments (30%), group project (10%), individual project (40%), weekly quizzes (10%), activity at practicals (10%). Grades: A 90%, B 80%, C 70%, D 60%, E 50%. More information on the course website.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be familiar with basic problems and methods in bioinformatics; they will be able to choose an appropriate method for a given biological problem and to interpret its results.

Class syllabus:
Basic concepts from probability, algorithms and machine learning. Sequencing and assembling genomes. Gene finding. Sequence alignment. Evolutionary models and phylogenetic trees. Comparative and population genomics. RNA structure. Motif finding and gene expression analysis. Protein structure and function. Selected current topics. Life science students will focus on understanding and correct application of these methods on real data.

Recommended literature:
Biological sequence analysis : Probabilistic models of proteins and nucleic acids / Richard Durbin ... [et al.]. Cambridge : Cambridge University Press, 1998
Understanding bioinformatics / Marketa Zvelebil, Jeremy O. Baum. New York : Garland Science, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 97					
A	B	C	D	E	FX
45,36	24,74	16,49	8,25	4,12	1,03
Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD.					
Last change: 27.10.2023					
Approved by:					

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-135/00	Methods of Biosignal Processing and Medical Imaging Computer Graphic (1)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: practical task
Final examination: test
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the course, students will be able to process signals from biological objects - part 1.

Class syllabus:
Image processing: physical principles of image registration, sampling, aliasing; image transformation, resampling, brightness transformations, binary operations; convolution, filtering, edge detectors, morphology and segmentation.
Data visualization: display and visualization of image and multidimensional data, acquisition of basic practical skills in available visualization system.

Recommended literature:
Biological Imaging and Sensing / T. Furukawa (Ed.). Berlin : Springer, 2004
The Scientist and Engineer's Guide to Digital Signal Processing / Steven W. Smith. California Technical Pub, 1997

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 169

A	B	C	D	E	FX
79,29	18,34	1,18	0,0	0,0	1,18

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-136/00	Methods of Biosignal Processing and Medical Imaging Computer Graphic (2)

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: practical task
Final examination: test
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the course, students will be able to process signals from biological objects - part 2.

Class syllabus:
Signal processing: signal types and sources; analog signal preprocessing; signal transmission, transmission and recording; noise and signal filtering; frequency analysis; mathematical modeling and signal fitting (statistical analysis); signal compression and coding.
Applications: optical microscopy, tomography, acoustics, electrophysiology.

Recommended literature:
Biological Imaging and Sensing / T. Furukawa (Ed.). Berlin : Springer, 2004
The Scientist and Engineer's Guide to Digital Signal Processing / Steven W. Smith. California Technical Pub, 1997

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 145

A	B	C	D	E	FX
86,9	10,34	2,76	0,0	0,0	0,0

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-125/15	Methods of Radiation Detection

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Examination: written and oral examination
Successful written part of the exam is a condition of participation in the oral exam
Share: (written / oral) 70/30
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, students will have an idea of the basic detection methods and detectors of ionizing radiation.

Class syllabus:
Basic terms and definitions, Interaction of radiation with matter, Detectors of nuclear radiation and elementary particles (Classification of detectors, Methods of signal generation in the detector, Methods of signal collection, Classification according to detector mode), General characteristics of detectors, Gas detectors Signal generation in ionization chamber (pulse), Signal duration, Ionization chamber with grating, Proportional computers (Gas amplification, Proportional computer design, Proportional computer properties, Detection efficiency), Geiger-Muller computers (Geiger discharge, Working gases, Extinguishing , Time characteristics, Efficiency, Utilization)
Coronary detectors. Spark detectors (ID). Scintillation detectors, Semiconductor detectors, Magnetic spectrometry methods, principles of using magnetic field for particle beam separation, focusing effects of magnetic field, spectrometer classification, Applications of detector systems (Radiation camera for healthcare, surface research, slow proton treatment of tumors using heavy particles, identification of isotopes in radioactive fallout, radiocarbon dating, dosimetry).

Recommended literature:
Introduction to Radiological Physics and Radiation Dosimetry / Frank Herbert Attix. Weinheim : Wiley-VCH , 2004
Radiation physics for medical physicists / E. B. Podgoršak. Heidelberg : Springer, 2010
Detekcia a spektrometria žiarenia alfa a beta / Štefan Šáro. Bratislava : Alfa, 1984

Experimentálna jadrová fyzika / Sergej Usačev ... [et al.]. Bratislava : Alfa, 1982

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

A	B	C	D	E	FX
0,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., RNDr. Miroslav Pikna, PhD.

Last change: 17.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/2-EFM-236/15	Modelling Biological Processes

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework, exam during the semester
Exam: written and oral
Approximate grading scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
Passing this subject, students will gain a basic understanding and overview of methods in biological modeling.

Class syllabus:
Biological modeling with ordinary differential equations: the principle of mass balance, mass action rule, scaling and nondimensionalisation, one-component models (Michaelis-Menten kinetics, gene autoregulation), multi-component models (biological switches, oscillators, epidemiology). Modeling with differential equations with delay. Models with spatial component: the reaction-diffusion systems, the spread of epidemics, pattern formation. Stochastic models: probability balance equation, Gillespie simulation algorithm, stochastic models of gene expression.

Recommended literature:
Mathematical biology : 1. : An introduction / J. D. Murray. New York : Springer, 2002
Mathematical biology : 2. : Spatial models and biomedical applications / J. D. Murray. New York : Springer, 2003
Keener, J., Sneyd, J., Mathematical physiology: I. Cellular physiology, 2nd. ed., Springer, New York, 2008
Wilkinson, D., Stochastic modelling for systems biology, 2nd ed., Chapman & Hall/CRC, Boca Raton, 2012.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 79					
A	B	C	D	E	FX
41,77	20,25	17,72	12,66	5,06	2,53
Lecturers: doc. Mgr. Pavol Bokes, PhD.					
Last change: 19.10.2016					
Approved by:					

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-120/22	Molecular Biophysics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
By completing the course, the student acquires a knowledge on the mechanisms of processes in the living systems on molecular level.

Class syllabus:
Structure and properties of nucleic acids. Superspiralization. DNA topology. DNA-protein interactions. DNA/RNA aptamers. The structure of proteins, peptide bond. Protein secondary structure. The types of interactions in macromolecules. The conformation of popypetide chain. Three dimensional structure of proteins. Phase transitions in biopolymers. (coil-globule transitions). The structure of biomembranes and their models. Membrane polymorphism. Phase transitions and membrane mechanical properties The mechanism of membrane conductivity. Passive and active ion transport. Membrane receptors. Mechanisms of mechanoreception and optical reception. Membrane theory of extication. Hodgkin and Huxley model. The structure of muscle and muscle fibers. The Hill experiments. Relation between force and load. Electrochemical coupling of muscle contraction. Theory of muscle contraction.

Recommended literature:
T. Hianik, Structure and physical properties of biomembranes and model membranes. Acta Physica Slovaca, 2006, vol. 56, No. 6, 687-805;
P.F. Dillon, Biophysics: a physiological approach, Cambridge University Press, 2012;

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 152

A	B	C	D	E	FX
47,37	31,58	13,16	7,24	0,66	0,0

Lecturers: prof. RNDr. Tibor Hianik, DrSc.

Last change: 22.02.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBF-226/15	Molecular Dynamics Simulations

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
Familiarization of students with the basics of simulations by molecular dynamics methods. Simulate simple systems using available software.

Class syllabus:
Laboratory and computer experiment, description of system with many particles, Verlet and Gear integrator, simple thermostats and barostats, intermolecular forces, corelation functions, simulations in NpT and NVT microcanonical ensembles, border conditions, sampling and time step, comparison of forcefields, system setting for simulations, simulation convergence, trajcetory analysis - visual inspection, analysis of RMSD, molecule fluctuations, radial distribution function (RDF), moment of gyration, dihedral angles, principal component analysis (PCA), estimation of interacting energies, entropies, analysis of interaction between parts of simulates system - e.g. hydrogen bonds, parametrisation of molecules, polarizable forcefields, combined quantum-classic simulations (QM/MM), simulated annealing, parallel tempering - replica exchange (REMD)

Recommended literature:
H. Gould, J. Tobochnik, W. Christian: An introduction to computer simulation methods : Applications to physical systems, San Francisco : Pearson, 2007
D. Frenkel, B. Smit: Understanding Molecular Simulation, Academic Press, 2002
Používateľský manuál a návody (tutorials) k programu GROMACS (https://www.gromacs.org) a Amber (https://www.amdbermd.org)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Ing. Milan Melicherčík, PhD., prof. RNDr. Ján Urban, DrSc.

Last change: 13.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-116/22	Nanostructures in Biophysics and Medicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Types of nanostructures - magnetic nanoparticles, fulleronosomes, transferosomes and liposomes. Physical properties of nanostructures: arrangement of lipid molecules, topological asymmetry, osmotic properties, permeability. Methods of preparation of nanostructures. Methods of optimal incorporation of substances - chemical and physical approaches. The influence of selected factors on the stability of their structure: processes of aggregation, fusion, solubilization, peroxidation and self-oxidation. Conditions for the stability of the nanostructure transmission system in the body. Mechanisms of cell-nanoparticle interaction: fusion, stable adsorption, endocytosis. Use in biophysics as cell model systems. Use in medicine - cancer chemotherapy, antimicrobial therapy, targeted drug delivery, electromagnetic hyperthermia. Application in diagnostics, magnetic nanoparticles as contrast agents in MR.

Recommended literature:
Biophysics : An introduction / Roland Glaser. Heidelberg : Springer, 2012.
Klaessig, F.; Marrapese, M. Abe, S. (2011). Nanotechnology Standards. Nanostructure Science and Technology. Springer, New York
Torchilin, V (2006). "Multifunctional nanocarriers". Advanced Drug Delivery Reviews 58 (14): 1532–55.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 11

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc.

Last change: 11.01.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚPA/2-FBM-108/00	Pathological Anatomy

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 4 / 2 **per level/semester:** 52 / 26
Form of the course: on-site learning

Number of credits: 7

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: oral (during exercise)
Final examination: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
After completing the course, students will be able to use the acquired knowledge about basic morphological changes in pathological conditions in the physical methods of biomedicine.

Class syllabus:
Definition of pathology, history, sources of information, basic terminology. Methods in pathology (Autopsy and its significance, Biopsy a its role in detrmination of clinical diagnosis, histology, histochemistry). Optical methods of investigation and possibility of application in pathology (non-polarized and polarized light, fluorescence, phase contrast, differential interference contrast, dark field, confocal, transmission and scanning electron microscopy, transmitted and reflected light). Physical chemistry and its application in pathology (Raman spectroscopy, infrared spectroscopy, secondary ion mass spectroscopy (SIMS), energy-dispersive analysis (EDX). Pathology of the cell (cellular pathology). Pathology of the extracellular matrix. Metabolic and regressive alterations (dystrophy, atrophy, necrosis, death). Disturbances of the blood and lympha. Causes of the diseases. Pathology of the environment. General oncopathology. Selected problems of special oncopathology. Pathology of central nervous system. Pathology of oral cavity and respiratory tract. Pathology of digestive tract. Pathology of cardiovascular system. Pathology of the muscle, bone and joints. Osteoporosis as actual problem of contemporary public health. Pathology of urinary system and genital system. Skin pathology. Pathology of lymphatic and hemopoietic systems. Pathology of the spleen. Pathology of endocrine system. Chronicity test and cancerogenity from pathologist view.

Recommended literature:
Harsh Mohan: Patológia. LIBRARY FM CU

Zaviačič M. (Ed): Kompendium patológie I a II, Bratislava 2002, Univerzita Komenského. Currently content of lectures available at home page of Institute of pathology, prof. Jakubovský home page and RNDr Kopáni home page (in progress).

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 136

A	B	C	D	E	FX
64,71	18,38	9,56	2,94	3,68	0,74

Lecturers: prof. MUDr. Pavel Babál, CSc., MUDr. Mgr. Vladimír Šišovský, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚPF/2-FBM-110/00	Pathological Physiology

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 4 / 2 **per level/semester:** 52 / 26
Form of the course: on-site learning

Number of credits: 7

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: tests
Final examination: oral exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
After completing the course, students will be able to use the acquired knowledge about the basic etiopathogenetic mechanisms of pathological conditions in the physical methods of biomedicine.

Class syllabus:
Pathophysiology of respiratory system, Pathophysiology of blood and haematologic system, Pathophysiology of cardiovascular system, Pathophysiology of kidneys and urinary system, Pathophysiology of endocrine system, Pathophysiology of nervous system, Pathophysiology of gastrointestinal tract, Pathophysiology of bones and joints, Fluid and electrolite disturbances, Disorders of acid-base homeostasis.

Recommended literature:
Hulín I. et al.: Patofyziológia a klinická fyziológia pre magisterské a bakalárske štúdium, Bratislava, SAP 2005, 593 s.,
Holzerová J. et al.: Experimentálne modely chorôb. Univerzita Komenského Bratislava, 2003, 113 s.,
Hulín I. et al.: Patofyziológia, 6. prepracované a doplnené vydanie, SAP 2002 - vybrané kapitoly.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 146

A	B	C	D	E	FX
78,77	11,64	2,05	2,05	4,79	0,68

Lecturers: prof. MUDr. Fedor Šimko, CSc., prof. MUDr. Marián Bernadič, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-213/00	Photobiophysics and Phototherapy

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: project
Final examination: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the course, students will be able to use the acquired knowledge about physico-chemical mechanisms of light interaction with biological objects in biomedical applications and research.

Class syllabus:
Subject of photobiophysics. Sunlight penetrating the Earth. Chromophores and fluorophores in biological objects. Non-physiological and physiological photobiological processes. Photoinformation processes. Photosynthesis. Bioluminescence. Principles of phototherapy and photodiagnostics.

Recommended literature:
Prosser, V. a kol.: Experimentální metody biofyziky. Academia, Praha, 1989.
Lakowicz, J. R.: Principles of Fluorescence Spectroscopy, Springer, 2006.
Hammes, G. G, Hoboken, N. J.: Spectroscopy for the biological sciences. Wiely, 2005.
Niemz M. H., Laser-Tissue Interactions. Fundamentals and applications. Springer, Berlin,2004.
Fotakis, C., Papazoglou T. G., Kalpouzos, C.: Optics and Lasers in Biomedicine and culture. Springer, Berlin, 1998.
Lowlor, D. W.: Photosynthesis. Third Edition. BIOS Scientific Publishers, Oxford, 2001.
Súčasné vedecké časopisy.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 103

A	B	C	D	E	FX
94,17	3,88	0,97	0,0	0,97	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB+KEF/2-FBF-102/00	Physical Chemistry and Electrochemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Continuous assessment: homework
Exam: oral
The evaluation of the subject takes place in the form of continuous (individual work -20% of total score) and final evaluation (oral exam). Successful completion of the course reflects the student's sufficient orientation in the issue. The course will be graded as provided the student demonstrates compliance with at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of FMFI UK
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The student will have developed a basic apparatus for understanding the physical nature of chemical processes, which may be encountered in other subjects (biochemistry, bioenergetics, plasma physics) as well as with the principles of some analytical methods used e.g. in biophysics.

Class syllabus:
Thermochemistry, creative, reaction and bond enthalpies, their use. Fundamentals of chemical thermodynamics, chemical potential and its application to the study of equilibrium processes. Fugacity, fugacity coefficient, activity, activity coefficient. Chemical equilibrium, equilibrium constant and its dependence on state variables. Affinity of a chemical reaction, conditions of spontaneous chemical course. reactions. Acid-base reactions and the theory of acids and bases. Galvanic cell, electrode potential, its use for measuring physico-chemical quantities. Introduction to chemical kinetics. Reaction order, methods of determining the reaction order. Reaction mechanisms and their relation to the kinetic equation. Homogeneous and heterogeneous catalysis. Autocatalysis, oscillating reactions.

Recommended literature:
http://www.chem1.com/acad/webtext/virtualtextbook.html

Languages necessary to complete the course:

english

Notes:

Past grade distribution
Total number of evaluated students: 113

A	B	C	D	E	FX
61,06	30,09	4,42	0,0	0,0	4,42

Lecturers: prof. Ing. Pavel Mach, CSc., doc. RNDr. Peter Papp, PhD.

Last change: 18.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-110/00	Physical Education and Sport (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of the students´ game skills in collective sports: basketball, volleyball, football, floorball and hockey. Mastering of the basic technique of a particular sport discipline in other sports. In paddling, basic training on still and slightly flowing water. Development of coordination skills, improvement of articular mobility and cardiovascular system.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1821

A	B	C	D	E	FX
97,8	0,6	0,05	0,0	0,0	1,54

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-120/00	Physical Education and Sport (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of offensive and defensive game combinations and playing with modified rules in collective sports such as basketball, volleyball, football, floorball, hockey. Command of elements of higher difficulty in locomotion skills (swimming - crawl stroke, breast stroke, butterfly stroke, trampoline jumping and aerobics – practicing of areobics compositions, bodybuilding – development of the main muscle groups, paddling on running water. Testing of the level of physical fitness and coordination skills.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1693

A	B	C	D	E	FX
98,58	0,35	0,06	0,06	0,06	0,89

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Branislav Nedbálek, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-210/00	Physical Education and Sport (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
To improve offensive and defensive game combinations in collective sports. Practicing of tactical and technical elements in individual sports. Compensatory exercises to correct wrong body posture. Stretching. Competition rules in sport disciplines.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1405

A	B	C	D	E	FX
98,58	0,43	0,07	0,0	0,07	0,85

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-220/00	Physical Education and Sport (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Sport training for Faculty Championships in a selected sport with modified rules. Selection of sport-talented students into teams of the Faculty Sport League, University League of Bratislava Faculties, and participation in sport events of the Faculty and University.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1209

A	B	C	D	E	FX
98,51	0,41	0,08	0,08	0,08	0,83

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Branislav Nedbálek, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-953/22	**Course title:** Physical Methods in Biomedicine
Number of credits: 2	
Educational level: II.	
Course requirements: oral state exam Scale of assessment (preliminary/final): 0/100	
Class syllabus: 1. Thin films, micelles, liposomes and interfaces 2. Rheology of biological fluids 3. Microscopic techniques (light, polarized, confocal, electron microscopy) 4. Force microscopes 5. Optical absorption spectroscopy and its applications in cell diagnostics 6. Fluorescence spectroscopy, fluorescence microscopy 7. Mass, Raman, Infrared spectroscopy 8. Turbidimetry, nephelometry, analyzers in hematology - aggregometry 9. Flow cytometry and its use in medicine 10. Stem cells - classification, principle, use in medicine, 11. Separation methods of biological samples: electrophoresis, centrifugation, distillation, extraction 12. Dialysis; Calorimetry (differential scanning, isothermal titration) 13. Chromatographic methods (paper, thin film, ion exchange, gel, affinity, capillary, gas, HPLC) 14. Types of biological signals, their origin, sensing and significance in medicine 15. Statistical analysis of biosignals, mathematical modeling and signal fitting 16. Visualization of biosignals 17. Tomography - principle and types 18. X-ray and CT (computed tomography) - principles and medical applications 19. PET - Positron emission tomography, gammagraphy, scintigraphy 20. SPECT - Single photon emission computed tomography 21. Electrophysiological methods of cell study 22. Methods of recording and analysis of bio-electromagnetic signals 23. Phototherapy and photodiagnostics 24. Ultrasound in medicine 25. Radiotherapy 26. Methods of genetic modulation 27. Medical applications of magnetic resonance 28. Internet portal eHealth, information systems	
State exam syllabus:	
Recommended literature: T. Furukawa (Ed.): Biological Imaging and Sensing. Berlin, Springer, 2004 D. Shi (Ed.): Biomedical devices and their applications. Berlin, Springer, 2004	

K. Najarian, R. Splinter.: Biomedical signal and image processing, second edition, CRP Press, Taylor & Francis, 2012
J. B. Pawley (Ed.): Handbook of biological confocal microscopy. New York, Springer, 2006
G. G. Hammes: Spectroscopy for the biological sciences. Wiley on line books, 2005
B. Nölting: Methods in modern biophysics, 3rd edition. Springer Verlag Berlin, 2009

Languages necessary to complete the course:
Slovak, English

Last change: 17.04.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB+KEF/1-OZE-311/15	Practical III

Educational activities:
Type of activities: laboratory practicals
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: protocols from completed exercises
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
By completing the course, students will gain experimental skills with the used instrumentation. They will make sure of the agreement between experiments and theories that clarify them in the realized experiments.

Class syllabus:
Subjective photometry and light detection, lens imaging, dispersion, properties of optical prism spectrograph, interference, two-beam light interference - Newtonian rings, polarization, sucrose optical activity, refractive index, abbe refractive index measurement by refractometer, light absorption examination, diffraction, Fresnel diffraction of light, Fraunhofer diffraction of light on a slit. Experiments in atomic physics (Franck - Hertz experiment, validation of Stefan-Boltzmann's law, range of alpha particles from Am241 in air), nuclear physics (statistical nature of nuclear processes, determination of gamma ray energy, verification of Compton scattering), applied nuclear physics (measurement of air radioactivity).

Recommended literature:
Fyzikálne praktikum IV : Atómová fyzika a detekcia ionizujúceho žiarenia / Matej Florek ... [et al.]. Bratislava : Univerzita Komenského, 1988
Instructions can be found here http://www.dnp.fmph.uniba.sk/~kollar/navodnik.htm
Fyzikálne praktikum III : Optika / Zuzana Chorvátová ...[et al.]. Bratislava : Univerzita Komenského, 1984

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 52

A	B	C	D	E	FX
65,38	19,23	7,69	0,0	0,0	7,69

Lecturers: doc. RNDr. Juraj Országh, PhD.

Last change: 01.02.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-240/15	Project Seminar

Educational activities:
Type of activities: seminar
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous evaluation: presentation of the project
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to obtain, present and discuss the latest information on physical methods used in medicine.

Class syllabus:
Students will prepare a project and present it at a seminar on the latest trends in the development of physical methods for medical applications.

Recommended literature:
Medical image processing reconstruction and restoration : Concepts and methods / Jiří Jan. Boca Raton, Fla. : Taylor & Francis, 2006
Biomedical devices and their applications / D. Shi (Ed.). Berlin : Springer, 2004
Selection of current articles in the field of biomedical physics.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 72

A	B	C	D	E	FX
98,61	0,0	0,0	0,0	0,0	1,39

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBF-108/22	Quantum Theory of Molecules

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary evaluation: test
Final exam: oral / written
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Get an overview of the possibilities of using quantum-chemical methods to model systems in chemistry and biology.

Class syllabus:
Methods of quantum chemistry. Heitler-London method. MO-LCAO method. Hartree-Fock method. Born - Oppenheimer's approximation. Method of density functional. Study of chemical reactivity. Molecules in solution and in the solid phase. Molecular dynamics. Electrical properties of molecules. Magnetic properties of molecules. Collision theories. Getting basic skills with the use of molecular modeling software.

Recommended literature:
P. Atkins, Quantum molecular mechanics, Oxford 2007.
P. Zahradník, R. Polák, Elements of Quantum Chemistry, Springer 1990.

Languages necessary to complete the course:
Slovak in combination with English (some of the suggested readings are in English).

Notes:

Past grade distribution
Total number of evaluated students: 57

A	B	C	D	E	FX
80,7	17,54	1,75	0,0	0,0	0,0

Lecturers: prof. RNDr. Peter Babinec, CSc.

Last change: 14.03.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-141/00	Radiation Biophysics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 1 **per level/semester:** 13
Form of the course: on-site learning

Number of credits: 1

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
The evaluation of the course takes the form of a project which the student defends. The course will be graded with a passing grade provided that the student demonstrates at least 51% compliance.
Grading: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), Fx (50-0).
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, students will gain basic knowledge of microdosimetry and will be able to apply them to evaluate the radiation risk of ionizing radiation.

Class syllabus:
Particle interaction and radiation energy storage in the material environment. Basic microdosimetric quantities. Experimental methods for obtaining microdosimetric spectra. Calculation of linear and specific energy spectra. Dose - effect relationship. Time course of the effects of ionizing radiation. Deterministic effects of ionizing radiation, Stochastic effects of ionizing radiation. Radiation effect of ionizing radiation with high LET (Bragg peak, relationship between LET and RBE, direct and indirect effect of ionizing radiation, radiation fractionation). Mathematical modeling of the dose-effect relationship (intervention and multi-intervention theory, two-way model, threshold-specific energy model, multimutation models, linear quadratic model, assumptions, derivation, utilization limits, survival curves and their interpretation). Exposure to radiation from natural and other sources. Epidemiological studies - a source of information on stochastic effects.

Recommended literature:
Radiation physics for medical physicists / E. B. Podgoršak. Heidelberg : Springer, 2010
Microdosimetry and Its Applications / Harald H. Rossi, Marco Zaider Springer, 1996

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
98,89	1,11	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Radoslav Böhm, PhD., doc. RNDr. Monika Müllerová, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-161/00	Russian Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian. The language level is A1.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject provides a course in Russian language for beginners.

Recommended literature:
The textbook: : Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 729

A	B	C	D	E	FX
58,16	16,46	10,7	4,25	1,78	8,64

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-162/00	Russian Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject continues the program of Russian language (1) and provides a course of Russian for beginners.

Recommended literature:
Textbook: Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 423

A	B	C	D	E	FX
65,01	15,6	8,98	3,78	0,95	5,67

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-261/00	Russian Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 207

A	B	C	D	E	FX
70,05	17,87	8,7	2,42	0,0	0,97

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-262/00	Russian Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 148

A	B	C	D	E	FX
75,68	13,51	6,76	2,7	0,68	0,68

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-171/20	Slovak Language for Foreign Students (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1).

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 60

A	B	C	D	E	FX
48,33	11,67	0,0	0,0	0,0	40,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-172/20	Slovak Language for Foreign Students (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1) and this course is a follow up course to the Slovak language course 1.

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 48

A	B	C	D	E	FX
83,33	2,08	2,08	0,0	0,0	12,5

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-271/20	Slovak Language for Foreign Students (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 2.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 28

A	B	C	D	E	FX
60,71	21,43	0,0	3,57	0,0	14,29

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-272/20	Slovak Language for Foreign Students (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 3.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 14

A	B	C	D	E	FX
92,86	7,14	0,0	0,0	0,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MAT-733/19	Software MATLAB

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KMANM/1-MAT-731/00 and FMFI.KMANM/1-MAT-732/00

Course requirements:
Continuous assessment: activity
Examination: group project, practical computer exam
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students will learn the basics of using MATLAB software. They will be able to use MATLAB to calculate some mathematical problems, read files or write to files, plot computed data, create complex functions for reuse and create a graphical user interface GUI for their programs.

Class syllabus:
Format and conversion of variables, vectors and matrices
Programming environment, so-called M-file
Reading from a file and protting data
Creating functions
Graphical GUI environment

Recommended literature:
MATLAB - SIMULINK I / Stefan Kozak, Slavomir Kajan. Bratislava: Slovak University of Technology, 1999 Matlab / Jela Babušíková. Bratislava: FMFI UK Library and Publishing Center, 2007
Kozák Š., Kajan S., Matlab - Simulink, 1. Slovak University of Technology in Bratislava, 1999. ISBN Dušek F., MatLab and Simulink, University of Pardubice, 2000
mathworks.com/help

Languages necessary to complete the course:
slovak

Notes:

Past grade distribution
Total number of evaluated students: 106

A	B	C	D	E	FX
23,58	14,15	16,04	13,21	14,15	18,87

Lecturers: RNDr. Patrik Mihala, PhD.

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-105/00	Special Practical in Biomedical Physics (1)

Educational activities:
Type of activities: laboratory practicals
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Final evaluation: Assignment of each single practical task
During the semester, it is necessary to complete 5 laboratory exercises and to prepare 5 separate laboratory protocols (max. 10 points for each protocol). Credits will only be awarded to a student with all laboratory exercises completed and all protocols submitted.
Indicative assessment scale: A 45 points, B 40 points, C 35 points, D 30 points, E 25 points
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to work in biophysical, biomedical, chemical, biological laboratories, prepare and evaluate samples, operate instruments, evaluate the data obtained.

Class syllabus:
Quantitative morphology of muscular tissue
Paper chromatography
Spectroscopic quantitative analysis of proteins/nucleic acids
Measurement of quantum fluorescence yield
Laser-induced fluorescence of tissue components in medical diagnostics
Free enthalpy of p-nitrophenol dissociation

Recommended literature:
Špeciálne praktikum z biomedicínskej fyziky a biofyziky / Libuša Šikurová (ed.). Bratislava 2007 (online)
Základy statistiky pro biomedicínské obory / Jana Zvárová. Praha: Karolinum, 2011 Physical Chemistry for the Chemical and Biological Sciences / Raymond Chang. Sausalito: University Science Books, 2000
Spectroscopy for the biological sciences / Gordon G. Hammes. Hoboken, N.J. : Wiley, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 153

A	B	C	D	E	FX
62,09	27,45	6,54	2,61	0,0	1,31

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-106/00	Special Practical in Biomedical Physics (2)

Educational activities:
Type of activities: laboratory practicals
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Final evaluation: Assignment of each single practical task During the semester, it is necessary to complete 5 laboratory exercises and to prepare 5 separate laboratory protocols (max. 10 points for each protocol). Credits will only be awarded to a student with all laboratory exercises completed and all protocols submitted. Indicative assessment scale: A 45 points, B 40 points, C 35 points, D 30 points, E 25 points
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to work in biophysical, biomedical, chemical, biological laboratories, prepare and evaluate samples, operate instruments, evaluate the data obtained.

Class syllabus:
Electron microscopy, High performance liquid chromatography, Preparation of monolayers at the water / air interface, Dimensions and zeta potential of liposomes, IR spectroscopy of biological samples, Density and specific volume of liposomes

Recommended literature:
Špeciálne praktikum z biomedicínskej fyziky a biofyziky / Libuša Šikurová (ed.). Bratislava 2007 (online).
Bioštatistika: model s náhodnými efektmi / Gejza Wimmer. Bratislava: Univerzita Komenského, 1999,
An Introduction to The Principles of medical imaging / Chris Guy, Dominic Ffytche. London: Imperial College Press, 2005.
Spectroscopy for the biological sciences / Gordon G. Hammes. Hoboken, N.J.: Wiley, 2005.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 147

A	B	C	D	E	FX
61,9	29,25	4,08	1,36	2,72	0,68

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-126/15	Specialised Practical Classes in Radiological Physics

Educational activities:
Type of activities: laboratory practicals
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary examination: evaluation of protocols.
Final examination: presentation of the results.
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 80/20

Learning outcomes:
Apply nuclear spectrometry solutions to practical problems.

Class syllabus:
Determination of relative intensities of gamma lines using a scintillation detector. Use of liquid scintillation spectrometry for the analysis of alpha and beta radiation spectra. Principles of using a directional scintillation detector. Ge (Li) and HPGe detector characteristics. Methods for determining the peak efficiency of the HPGe detector. Spectrum analysis of a multicomponent radioactive source. Coincidence methods of gamma spectrometry, analysis of the 152Eu decay scheme. Activation analysis method. Spontaneous fission of nuclei (252Cf). Nucleus radius measurement.

Recommended literature:
W. R. Leo, Techniques for nuclear and particle physics, Springer Verlag, Berlin, 1996
K. Kleinknecht, Detectors for particle radiation, Cambridge University Press, 1998
electronic text by e-mail

Languages necessary to complete the course:
Slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 0

A	B	C	D	E	FX
0,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., RNDr. Imrich Szarka, CSc., Mgr. Ivan Kontuľ, PhD.
Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FBM-236/15	Specifics of Interdisciplinary Teamwork

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KJFB/2-FBM-236/00

Course requirements:
Preliminary evaluation: homeworks / tests / team work - presentations
Final exam: oral / written presentation of the semestral project
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
After completing the course, students will master the basic principles of communication, argumentation and presentation, they are able to assess the pros and cons of teamwork in the medical and academic environment, the sources of possible conflicts and ways to resolve them.

Class syllabus:
Basic characteristics of the medical and healthcare environment, system of structure and management of medical facilities, defined powers and responsibilities. The Health Care Act, the Convention on Human Rights and Biomedicine and other EU legal standards for research involving human beings and animals. Ethics in medicine, protection of individual and personal data, professional and medical secrecy, patient vs. client. Basic and clinical research in medicine, work of the ethics committee, application form for the ethics committee, types of studies in biomedical research, procedures for the introduction of new diagnostic and therapeutic methods and related problems: medical, legislative, social, economic. Composition of interdisciplinary teams and reasons for their creation, personality factors of medical and health professionals, rights and obligations. Career planning after graduation, Personality questionnaire - estimation of personality profile and skills. Principles of communication, argumentation and presentation. Job market, job interview, professional CV, motivation letter. Levies.

Recommended literature:
Legislatíva biomedicínskeho výskumu:
- Zákon 39/ 2007 Z.z. o veterinárnej starostlivosti, Nariadenie vlády SR č. 377/2012 a Vyhláška 436/2012, ktoré ustanovujú požiadavky na ochranu zvierat používaných na vedecké alebo vzdelávacie účely,

- Zákon č. 576/2004 Z. z. o zdravotnej starostlivosti, ktorý vymedzuje biomedicínsky výskum,
- Helsinská deklarácia (Etické princípy výskumu s účasťou ľudských subjektov), ochrana osobnosti a medicínske právo, Dohovor o ochrane ľudských práv a dôstojnosti človeka v súvislosti s aplikáciou biológie a medicíny, Dohovor o ľudských právach a biomedicíne,
- Dokumenty Svetovej zdravotníckej organizácie (WHO)

Data a znalosti v biomedicíně a zdravotnictví / editoři Jana Zvárová, Lenka Lhotská, Vladimír Přibík. Praha : Karolinum, 2010
Katz, Michael J. (2009). From Research to Manuscript. A Guide to Scientific Writing. Springer Science + Business Media B.V., 210 p. e-ISBN 978-1-4020-9467-5
Štěpaník J. (2005) Umění jednat s lidmi 2 Komunikace. Grada publishing, Praha, 164 s. ISBN 80-247-0844-2.
Giertlová Klára (2004). Manažovať a koučovať systemicky? Áno. Co/Man, 158 s. ISBN 8089090079.
Plamínek J (2009). Konflikty a vyjednávání. Grada Publishing Praha. 136 s. ISBN 978-80-247-2944-2.
Helcl Z. (2013). Jak zvládnout 77 obtížných situací při prezentacích a přednáškách. Grada Publishing Praha. 224 s. ISBN 978-80-247-4770-5
Corfield Rebecca (2005). Připravujeme životopis. Jak zvýšit své šance na získání zaměstnání, o které se ucházíte (orig. Preparing your own CV. How to improve your chances of getting the job you want.) Ekopress, 130 s. ISBN 8086119939
Corfield R. (2005). Jak úspěšně zvládnout přijímací pohovor. Computer Press, a.s. Brno. 72 s. ISBN 80-251-0688-8.

Languages necessary to complete the course:
Slovak in combination with English

Notes:

Past grade distribution
Total number of evaluated students: 62

A	B	C	D	E	FX
98,39	0,0	1,61	0,0	0,0	0,0

Lecturers: doc. RNDr. Iveta Waczulíková, PhD.

Last change: 12.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-115/17	Sports in Natur (1)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Acquisition and development of basic motor skills and abilities in selected sports: skiing and snowboarding. Mastering the correct technique of performing individual movements, which are necessary for skiing and snowboarding.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: skiing, snowboarding. The lessons in the courses are focused on the development of basic and special movement skills and mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 132

A	B	C	D	E	FX
99,24	0,0	0,0	0,0	0,0	0,76

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 16.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-116/18	Sports in Natur (2)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%.
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Creating a positive and lasting relationship with physical activity. Acquisition and mastery of basic motor skills and abilities in outdoor sports: windsurfing, beach volleyball, water tourism - river rafting, hiking and other sports according to interest. Training and improving the technique needed for the sports.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: water tourism - river rafting, windsurfing, beach volleyball, hiking and other hobby sports. The lessons in the courses are focused on the development of basic and special movement skills and, mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ will provide sports equipment.

Past grade distribution
Total number of evaluated students: 74

A	B	C	D	E	FX
94,59	0,0	0,0	0,0	0,0	5,41

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký
Last change: 16.06.2022
Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-954/15	**Course title:** Theoretical Fundamentals of Medicine
Number of credits: 2	
Educational level: II.	
Course requirements: Examination: oral state exam Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The student will repeat the theoretical foundations of medicine and thus gain the necessary overview.	
Class syllabus: 1. Atrophy, dystrophy, necrosis 2. Hypertrophy, hyperplasia 3. Disorders of ventilation, diffusion and perfusion 4. Types of hypoxia 5. Lung diseases caused by pollutants in the inhaled air 6. Chronic respiratory diseases (bronchitis, emphysema, asthma) 7. Respiratory insufficiency 8. Anemia 9. Leukocyte disorders 10. Contraction-relaxation cycle of the heart muscle 11. Myocardial contractile function, pump function of the heart 12. Hypertrophy of the heart 13. Cardiomyopathy 14. Heart failure 15. Acquired heart defects 16. Congenital heart defects 17. Systemic arterial hypertension 18. Shock states 19. Atherosclerosis 20. Ischemic heart disease, angina pectoris, myocardial infarction 21. Pulmonary hypertension, cor pulmonale 22. Pathophysiology of cerebral circulation, intracranial hemorrhage, cerebral infarction 23. Electrophysiological basis of heart rhythm disorders 24. Disorders of sinusoatrial node function, disorders of A-V conduction, tachyarrhythmias 25. Diseases of the venous system 26. Disorders of glomerular function, glomerulonephritis, glomerulopathy 27. Renal failure 28. Diabetes mellitus 29. Intracranial hypertension 30. Epilepsy	

31. Demyelinating and degenerative CNS disease
32. Liver cirrhosis, portal hypertension, ascites, liver failure
33. Jaundice
34. Generalized skeletal disorders
35. Dehydration, hyperhydration
36. Disorders of electrolyte economy (Na +, K +, Ca2 +)
37. Disorders of acid-base balance
38. Pathophysiology of the thyroid gland
39. Pathophysiology of parathyroid glands

State exam syllabus:

Recommended literature:
Harsh Mohan: Patológia. KNIŽNICA LF UK

Languages necessary to complete the course:
Slovak, English

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/2-FBM-151/22	Uses of Plasmas and Electric Fields in Biomedicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary evaluation: processing of literature on selected topic and its presentation
Final exam: oral
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
By completing the course the student will gain a comprehensive overview of the use of plasma and electric discharges, and pulsed electric fields in selected biomedical applications and therapeutic methods and an understanding of their basic principles.

Class syllabus:
Basic concepts of plasma physics, the formation of low-temperature plasma in electric discharges. Low-temperature plasma and pulsed electric fields for biological decontamination and sterilization of microorganisms (bacteria, spores, yeasts, biofilms) in air, water, surfaces, medical instruments, in living organisms. Thermal and chemical methods of disinfection/sterilization. Food spoilage prevention. Medical in-vivo, ex-vivo and in-vitro applications of plasma, plasma surgery, treatment of skin diseases, disinfection and wound healing, tooth decay and root canals. Selective induction of apoptosis and cancer treatment, cell manipulation.
Interaction of liquids with plasma and plasma activated fluids. Cell interaction with plasma, plasma activated liquids and pulsed electric field. Induced cellular and systemic processes in organisms. Importance of reactive oxygen and nitrogen forms, electroporation and electropermabilization of cell membranes. Bio-compatible and antimicrobial plasma surface treatment.

Recommended literature:
· M. Laroussi et al. (eds.): Plasma medicine: applications of low-temperature gas plasmas in medicine and biology. Cambridge University Press, 2012
· A. Fridman and G. Friedman: Plasma medicine, Wiley 2013
· Z. Machala; K. Hensel; Y. Akishev (Eds.): Plasma for Bio-Decontamination, Medicine and Food Security, NATO Science for Peace and Security Series A: Chemistry and Biology, Springer 2012

· H-R. Metelmann, T. von Woedtke, K-D. Weltmann: Comprehensive Clinical Plasma Medicine, Springer 2018
Electronic texts available on the subject website

Languages necessary to complete the course:
Slovak in combination with English (some of the suggested readings are in English).

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
50,0	50,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Zdenko Machala, DrSc.

Last change: 14.03.2022

Approved by: