Course descriptions

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COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/1-OZE-344/22	Analytical Methods of Environmental Physics (1)

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

Number of credits: 3

Recommended semester: 5.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation:
Final exam: oral / written
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 10/90

Learning outcomes:
The student will gain knowledge of analytical methods used in environmental physics to analyze gases, liquids and solids, specifically to determine the composition and quality of air and water. The course will also include a demonstration of equipment in laboratories and analysis of selected samples.

Class syllabus:
Introduction to spectroscopy and chromatography.
Infrared absorption and Raman scattering spectroscopy. Ultraviolet absorption spectroscopy and colorimetry. Fluorescence spectroscopy. Chemiluminescence. Electrochemical methods. Gas chromatography.
Theory of rotational, vibrational and electron spectra. Composition of spectrometers - radiation sources, monochromators, interferometers and detectors. Sample preparation and analysis by transmission and reflection techniques. Spectrum manipulation, adjustment and interpretation.
Classification of chromatographic methods. Chromatograph composition. Separation principles. Columns and detectors. Quantification.
Monitoring of pollutants in gaseous and aqueous media and sampling. Demonstration of some equipment, techniques and analysis of selected samples.

Recommended literature:
S.K. Dogra: Molecular spectroscopy, Tata McGraw Hill (2012)
B. C. Smith: Fundamentals of FTIR, CRC Press (1996)
J. R. Lakowicz: Principles of fluorescence spectroscopy, Springer (2006)
H. M. NcNair and J. M. Miller: Basic gas chromatography, Wiley (2009)

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: 4

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

Lecturers: doc. RNDr. Karol Hensel, PhD.

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.AÚ/1-BMF-120/00	Anatomy (1)

Educational activities:
Type of activities: lecture / laboratory 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: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: test
Final exam: oral / Summer
Indicative evaluation scale: A 94%, B 88%, C 82%, D 76%, E 70%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The student will master the basic anatomical nomenclature and gain knowledge about the architecture and structure of the human body, namely the individual parts of the skeletal system and the joints of bones, muscles, digestive, respiratory and excretory system, male and female genitals organs.

Class syllabus:
Lectures: Introduction into study of anatomy. General osteology, arthrology, myology. The digestive system. The respiratory system. The excretory system. Female genitals. Male genitals.
Practical lessons: Vertebrae, joints of the vertebral column. Thorax skeleton, joints of the thorax. Skeleton of the upper limb. Skeleton of the lower limb. Joints of the upper and lower limbs. Skull. Test. Muscles of the upper limb. Muscles of the lower limb.. Muscles of the thorax, back and abdomen. Muscles of the head and neck. Test

Recommended literature:
Beňuška, J. a kol. Anatómia pre medziodborové štúdium I. Bratislava: UK, 1995. 176 s.
Mráz, P. a kol.: Anatómia pre medziodborové štúdium II. Bratislava: UK, 2001. 195 s.
Beňuška, J. a kol. Anatómia pre nelekárske študijné odbory 1. Bratislava: UK, 2005. 148 s.
Beňuška, J. a kol. Anatómia pre nelekárske študijné odbory 2. Bratislava: UK, 2005. 136 s.

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

Notes:

Past grade distribution
Total number of evaluated students: 287

A	B	C	D	E	FX
36,24	27,53	19,51	8,36	8,01	0,35

Lecturers: doc. RNDr. Ladislav Guller, CSc., doc. MUDr. Eliška Kubíková, PhD., MPH, prof. MUDr. Pavel Babál, CSc., Mgr. Silvia Mužiková

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.AÚ/1-BMF-155/00	Anatomy (2)

Educational activities:
Type of activities: lecture / laboratory 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: 2.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: test
Final exam: oral / Summer
Indicative evaluation scale: A 94%, B 88%, C 82%, D 76%, E 70%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The student masters the basic anatomical nomenclature and gains additional knowledge about the structure and structure of the human body: cardiovascular, lymphatic and nervous system, sensory organs and endocrine glands.

Class syllabus:
Lectures: Heart. Arteries. Veins. Lymphatic system. Spinal cord, spinal nerves. Medulla oblongata, pons. Cerebellum. Mesencephalon. Diencephalon. Telencephalon. Cranial nerves. Autonomic nervous system. Sense organs. Endocrine system. Skin.
Practical lessons: Demonstration of the digestive system organs. Demonstration of the respiratory system organs. Demonstration of the urinary and reproductive system organs. Test. Heart. Vessels of the thorax, abdomen, head, neck, and limbs. Spinal cord, spinal nerves.Cranial nerves.Test. Brain.

Recommended literature:
Beňuška, J. a kol. Anatómia pre medziodborové štúdium I. Bratislava: UK, 1995. 176 s.
Mráz, P. a kol.: Anatómia pre medziodborové štúdium II. Bratislava: UK, 2001. 195 s.
Beňuška, J. a kol. Anatómia pre nelekárske študijné odbory 1. Bratislava: UK, 2005. 148 s.
Beňuška, J. a kol. Anatómia pre nelekárske študijné odbory 2. Bratislava: UK, 2005. 136 s.

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

Notes:

Past grade distribution
Total number of evaluated students: 231

A	B	C	D	E	FX
35,5	18,18	16,45	9,52	12,12	8,23

Lecturers: doc. RNDr. Ladislav Guller, CSc., doc. MUDr. Eliška Kubíková, PhD., MPH, prof. MUDr. Pavel Babál, CSc.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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. Radoslav Böhm, PhD., doc. RNDr. Monika Müllerová, PhD., RNDr. Terézia Eckertová, PhD.

Last change: 11.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-UFY-241/10	Atomic and Nuclear Physics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 4.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: presentation of homework results (3x10 marks)
Exam: written (40 marks), oral (30 marks)
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Credits will be awarded if the student obtains at least 50% points.

Learning outcomes:
Graduates have a basic knowledge of Atomic and Nuclear Physics at the level of a core university course in general physics. They know how to use the concepts and methods of atomic and nuclear physics in solving problem situations. They have an idea of the boundaries between high school and university physics in the field of nuclear and nuclear in terms of work with high school youth with an increased interest in physics.

Class syllabus:
Photoelectric effect, Compton effect, Rutherford experiment, Bohr model, timeless Schrödinger equation, structure of atoms and molecules, basic properties of nuclei, structure of nuclei, transformation of nuclei, nuclear reactions, nuclear power plant, particle accelerators.

Recommended literature:
Fyzika část 5. Moderní fyzika : Vysokoškolská učebnice obecné fyziky / David Halliday, Robert Resnick, Jearl Walker ; přeložili Bohumila Lencová ... [et al.]. Brno : Vysoké učení technické VUTIUM, 2000
Všeobecná fyzika : 4 : atómová fyzika / Ján Vanovič. Bratislava : Alfa, 1980
Physics : principles with applications / Douglas C. Giancoli. Upper Saddle River, N.J. : Pearson/ Prentice Hall, 2005
Own electronic texts of the subject published through the course website.

Languages necessary to complete the course:
Slovak and English.

Notes:

Past grade distribution Total number of evaluated students: 195					
A	B	C	D	E	FX
21,54	17,95	18,97	16,92	21,54	3,08
Lecturers: doc. RNDr. Radoslav Böhm, PhD., Ing. Jakub Kaizer, PhD.					
Last change: 18.06.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 138

A	B	C	D	E	FX
89,13	6,52	2,9	1,45	0,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc.

Last change: 11.01.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 143

A	B	C	D	E	FX
86,71	8,39	2,1	1,4	0,7	0,7

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

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 169

A	B	C	D	E	FX
66,27	20,12	8,88	0,59	2,96	1,18

Lecturers: Ing. Vladimír Mlynárik, DrSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM+KJFB/1-BMF-110/25	Basics of Mathematics (1)

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

Number of credits: 9

Recommended semester: 1.

Educational level: I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: 3 written partial exams (100%)
Final exam: oral (45%) / written (55%)
Indicative evaluation scale: A 90%, B 80%, C 70%, D 65%, E 55%
Scale of assessment (preliminary/final): 40/60
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
After completing the course, students will gain basic knowledge and skills of linear algebra and geometry and differential calculus for functions of one real variable.

Class syllabus:
Linear algebra and geometry (determinants, matrices, systems of linear equations, linear spaces, linear mappings, scalar and cross products, quadratic forms).
Differential calculus for functions of one real variable (limits and continuity, the derivative and differentiability, main theorems of the differential calculus and their consequences, Taylor's formula, graphing a function).

Recommended literature:
Matematika 1 : Pre štúdium technických vied / I. Kluvánek...[et al.]. Bratislava : SVTL, 1966
Matematika 1 : Príručka pre vysoké školy technické / Ján Ivan. Bratislava : Alfa, 1984
Lineárna algebra a geometria : Cesta z troch rozmerov s presahmi do príbuzných odborov / Pavol Zlatoš. Bratislava : Albert Marenčin, 2011
Zbierka úloh z vyššej matematiky : 1. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Alfa, 1971
Zbierka úloh z vyššej matematiky : 2. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Slovenské vydavateľstvo technickej literatúry, 1966
Zbierka úloh z vyššej matematiky : 3. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Slovenské vydavateľstvo technickej literatúry, 1967

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 208

A	B	C	D	E	FX
7,69	9,62	14,9	14,42	21,15	32,21

Lecturers: doc. RNDr. Eugen Viszus, CSc., doc. RNDr. Radoslav Böhm, PhD.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM+KJFB/1-BMF-150/25	Basics of Mathematics (2)

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

Number of credits: 9

Recommended semester: 2.

Educational level: I.II.

Prerequisites: FMFI.KMANM+KJFB/1-BMF-110/15 - Basics of Mathematics (1) or FMFI.KMANM+KJFB/1-BMF-110/25 - Basics of Mathematics (1)

Recommended prerequisites:
1-BMF-110 Basics of mathematics (1)

Course requirements:
Preliminary evaluation: 3 written partial exams (100%)
Final exam: oral (45%) / written (55%)
Indicative evaluation scale: A 90%, B 80%, C 70%, D 65%, E 55%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
After completing the course, students will gain basic knowledge and skills of differential calculus for functions of several variables, integral calculus for functions of one variable, convergence of series and elementary methods of solving ordinary differential equations.

Class syllabus:
Differential calculus for vector-valued functions of one real variable, differential calculus for functions of several real variables (limits and continuity, partial derivative and differentiability, Taylor's formula, extremal points, implicit functions, constrained critical points). Integral calculus for functions of one real variable (indefinite integral, Riemann's definite integral, improper integral). Series, elementary methods of solving ordinary differential equations.

Recommended literature:
Matematika pre štúdium technických vied : 1. diel / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Slovenské vydavateľstvo technickej literatúry, 1959
Matematika pre štúdium technických vied : 2 diel / I. Kluvánek...[et al.]. Bratislava : SVTL, 1965
Matematika 1 : Príručka pre vysoké školy technické / Ján Ivan. Bratislava : Alfa, 1984
Matematika 2 / Ján Ivan. Bratislava : Alfa, 1989
Zbierka úloh z vyššej matematiky : 2. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Alfa, 1986

Zbierka úloh z vyššej matematiky : 3. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Slovenské vydavateľstvo technickej literatúry, 1967
Zbierka úloh z vyššej matematiky : 4. časť / Jozef Eliaš ... [et al.]. Bratislava : Alfa, 1972

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 163

A	B	C	D	E	FX
6,75	7,98	19,02	18,4	25,77	22,09

Lecturers: doc. RNDr. Eugen Viszus, CSc., doc. RNDr. Radoslav Böhm, PhD.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-BMF-226/25	Basics of Mathematics (3)

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: 3.

Educational level: I.II.

Prerequisites:

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

Learning outcomes:
Acquisition of knowledge. The student will be able to use integral calculus in N-dimensional Euclidean spaces, line integral as a tool for solving physical problems. He will also be acquainted with the use of power series methods.

Class syllabus:
1. Power series, Taylor series
2. Multidimensional integrals
3. Line integrals, potential vector fields

Recommended literature:
Demetrian, M., Integrály v R6N, integrály závislé od parametra, krivkové a plošné integrály, Univerzita Komenského : Bratislava, 2023
Matematika : diel 1 : pre štúdium technických vied / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Alfa, 1971
Matematika pre štúdium technických vied : 2. diel / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Alfa, 1970
Cvičenia z matematickej analýzy II / Zbyněk Kubáček, Ján Valášek. Bratislava : Univerzita Komenského, 1996
Matematická analýza IV / Mária Barnovská, Kristína Smítalová. Bratislava : Univerzita Komenského, 1984
Zbierka úloh z vyššej matematiky : 1. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Alfa, 1968

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 157

A	B	C	D	E	FX
10,19	12,74	12,74	21,66	24,84	17,83

Lecturers: doc. RNDr. Michal Demetrian, PhD., doc. RNDr. Eugen Viszus, CSc., RNDr. Michal Pospíšil, PhD.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-BMF-261/25	Basics of Mathematics (4)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: I.II.

Prerequisites:

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

Learning outcomes:
The student will gain experience in working with Fourier series and experience in the formulation and solution of problems regarding heat conduction (and diffusion)

Class syllabus:
1. Functional series
2. Orthogonal developments and Fourier series
3. Heat conduction and diffusion - mathematical methods

Recommended literature:
Fourierove rady a Fourierov integrál / Michal Demetrian. Bratislava : Univerzita Komenského, 2012
Matematika pre štúdium technických vied : 2. diel / Igor Kluvánek, Ladislav Mišík, Marko Švec. Bratislava : Alfa, 1970
Matematická fyzika : Základné rovnice a špeciálne funkcie / Vasilij Jakovlevič Arsenin ; preložil Jozef Kačur. Bratislava : Alfa, 1977
Zbierka úloh z vyššej matematiky : 1. časť / Jozef Eliaš, Ján Horváth, Juraj Kajan. Bratislava : Alfa, 1971

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 141

A	B	C	D	E	FX
14,18	17,73	16,31	17,02	24,11	10,64

Lecturers: doc. RNDr. Michal Demetrian, PhD., doc. RNDr. Eugen Viszus, CSc.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-OZE-610/15	Basics of Radiation Physics 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: 4.

Educational level: I., I.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:
Graduates of the course will have basic knowledge of radiation physics and principles of radiation protection, and will also gain a comprehensive view of the applications of ionizing radiation in practice. The lecture will also help students more easily accept the laws of the microworld, which are unimaginable for a classical physicist.

Class syllabus:
Sources of ionizing radiation: radionuclide sources, accelerators as sources of ionizing radiation. Quantities and units in radiation physics and protection: quantities characterizing radiation sources, radiation field and radiation action on matter, relationships between radiation quantities. Biological effects of ionizing radiation and their health effects. Environmental radioactivity: sources of radioactivity, distribution of radionuclides in nature, radiotoxicity. Applications of ionizing radiation: medical diagnostics and therapy, nuclear power, industrial irradiators, radioactive dating. Radioactive waste. Basic principles of radiation protection. Radiation protection of workers, residents and the environment. Dose limits. Monitoring in radiation physics and protection. Sources of ionizing radiation: radionuclide sources, nuclear reactors, accelerators as sources of ionizing radiation.
Wave properties of particles (description of particles in quantum mechanics – de Broglie waves and their superposition, wave packets, uncertainty principle). Equivalence of particle motion in a force field with the passage of light waves in an optical medium. Optics versus quantum mechanics, timeless SHR and its solution. Simple systems (potential walls, mounds, wells and their applications). Approximate method for solving SCHR.

Recommended literature:
O.Holá, K.Holý: Radiačná ochrana- Ionizujúce žiarenie, jeho účinky a ochrana pred ionizujúcim žiarením. STU, Bratislava,2010.

V.Klener: Principy a praxe radiační ochrany, SUJB, Praha, 2000

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 105

A	B	C	D	E	FX
60,0	11,43	12,38	8,57	6,67	0,95

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

Last change: 08.07.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MAT-510/00	Biomathematics (1)

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: 5.

Educational level: I., I.II.

Prerequisites: FMFI.KMANM/1-MAT-250/22 - Mathematical Analysis (4) or FMFI.KMANM/1-MAT-250/14 - Mathematical Analysis (4) or FMFI.KMANM/1-MMN-250/22 - Mathematical Analysis (4) or FMFI.KMANM/1-MMN-250/17 - Mathematical Analysis (4) or FMFI.KMANM/1-BMF-261/22 - Basics of Mathematics (4) or FMFI.KMANM/1-BMF-226/15 - Basics of Mathematics (3)

Course requirements:
Scale of assessment (preliminary/final): 40/60

Learning outcomes:

Class syllabus:
Selection dynamics and population genetics: Hardy-Weinberger law for two and more alleles, the selection equation, the mutation selection equation, the selection recombination equation.
Models of population ecology: logistic equation, Lotka-Volterra equations for predator-prey systems with and without intraspecific competition.

Recommended literature:
J. Hofbauer, K. Sigmund: The Theory of Evolution and Dynamical systems, Cambridge University Press, Cambridge 1988.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 158

A	B	C	D	E	FX
53,16	16,46	17,09	6,96	3,8	2,53

Lecturers: prof. RNDr. Jaroslav Jaroš, CSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/1-MAT-515/00	Biomathematics (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: 6.

Educational level: I., I.II.

Prerequisites: FMFI.KMANM/1-MAT-510/00 - Biomathematics (1)

Course requirements:

Learning outcomes:

Class syllabus:
Models of population ecology: the equilibria and their stability, Lotka-Volterra equations for more than two populations.
Game dynamics: evolutionary stable strategies, evolution of phenotypes, equations for asymmetric games.

Recommended literature:
J. Hofbauer, K. Sigmund: The Theory of Evolution and Dynamical systems, Cambridge University Press, Cambridge 1988.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 67

A	B	C	D	E	FX
44,78	16,42	22,39	13,43	1,49	1,49

Lecturers: prof. RNDr. Jaroslav Jaroš, CSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 14

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

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

Last change: 04.02.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-956/25	**Course title:** Biomedical Physics
Number of credits: 2	
Educational level: I.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. Principles of cell structural organization, types of organelles and their importance, cell locomotor system, cell growth and division 5. Cell division, intercellular connections, necrosis, apoptosis, excessive cell proliferation (cancer) 6. Membrane biophysics, lipid bilayer, phase transitions, membrane models, role of lipids and proteins in the membrane 7. Passive transport of substances across membranes 8. Active transport of substances across membranes 9. Protein-lipid interactions, ion channels, exchangers, membrane receptors 10. Electrical properties of cells. Rest potential. 11. Physics of nerve impulse, structure of nerve cell, formation of action potential, Hodgkin-Huxley model 12. Synaptic transmission in the neuromuscular junction and in the central nervous system. 13. Molecular mechanisms of memory and learning 14. Muscle contraction, muscle structure, muscle proteins, biophysics of muscle contraction, mechanochemical coupling, basics of muscle regulation 15. Electrical activity of skeletal muscle cells and heart muscle. 16. Cell bioenergetics, mechanisms of membrane phosphorylation 17. Influence of physical factors on biosystems, influence of ionizing and non-ionizing radiation mechanisms 18. Photosynthesis of plants and bacteria 19. Photoreception, mechanisms of vertebrate and invertebrate vision 20. Thin films, micelles, liposomes and interfaces 21. Rheology of biological fluids 22. Microscopic techniques (light, polarized, confocal, electron microscopy) 23. Force microscopes	

24. Optical absorption spectroscopy and its applications in cell diagnostics
25. Fluorescence spectroscopy, fluorescence microscopy
26. Mass, Raman, Infrared spectroscopy
27. Flow cytometry and its use in medicine
28. Stem cells - classification, principle, use in medicine,
29. Separation methods of biological samples: electrophoresis, centrifugation, distillation, extraction
30. Dialysis; Calorimetry (differential scanning, isothermal titration)
31. Chromatographic methods (paper, thin film, ion exchange, gel, affinity, capillary, gas, HPLC)
32. Types of biological signals, their origin, sensing and significance in medicine
33. Statistical analysis of biosignals, mathematical modeling and signal fitting
34. Visualization of biosignals
35. Tomography - principle and types
36. X-ray and CT (computed tomography) - principles and medical applications
37. PET - Positron emission tomography, gammagraphy, scintigraphy
38. SPECT - Single photon emission computed tomography
39. Electrophysiological methods of cell study
40. Methods of recording and analysis of bio-electromagnetic signals
41. Phototherapy and photodiagnostics
42. Ultrasound in medicine
43. Radiotherapy
44. Methods of genetic modulation
45. Medical applications of magnetic resonance
46. Internet portal eHealth, information systems

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
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: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 67

A	B	C	D	E	FX
74,63	19,4	5,97	0,0	0,0	0,0

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

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-AIN-407/22	Brain and Mind

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

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: presence (30%), presentation (40%), bonus assignments (30%)
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The course objectives are to make the students familiar with major theories and methods of mind/ brain research.

Class syllabus:
The subject of the course is the human mind and brain from the perspective of neuroscience, computer science, psychology, and philosophy. It is mainly focused on the interdisciplinary study of consciousness: its neural correlates, neuroscience and behavioral research methods, and major theories.

Recommended literature:
S. Blackmore, E.T. Troscianko: Consciousnes. An Introduction. Routledge, third edition 2018.
M.S. Gazzaniga, R.B. Ivry, G.R. Mangun: Cognitive Neuroscience. The Biology of the Mind. W.W. Norton & company, fifth edition 2019.
J. Friedenberg, G. Silverman: Cognitive Science. An Introduction to the Study of Mind. Sage 2012.
T. Metzinger: The Ego Tunnel. The Science of the Mind and the Myth of the self. Basic Books 2009.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 235					
A	B	C	D	E	FX
50,64	15,32	13,19	9,79	2,98	8,09
Lecturers: RNDr. Barbora Cimrová, PhD., doc. PhDr. Ján Rybár, PhD.					
Last change: 04.07.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-AIN-408/22	Cognitive Laboratory

Educational activities:
Type of activities: course
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., 5.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
Acquisition of methods for studying various cognitive phenomena (data collection and analysis) using an online cognitive laboratory.

Class syllabus:
Demonstration of 40 standard experiments in the fields of neurocognition, mechanisms of perception, attention systems, memory processes, speech production and perception, knowledge representation (concepts and mental ideas), judgment and decision-making processes.

Recommended literature:
CogLab / Greg Francis, Ian Neath, Daniel R. VanHorn. Thomson/Wadsworth, 2014

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 94

A	B	C	D	E	FX
64,89	12,77	9,57	1,06	0,0	11,7

Lecturers: doc. PhDr. Ján Rybár, PhD.

Last change: 17.05.2024

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/1-BMF-181/15	Complementary Classes in Mechanics

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., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: tests
Final exam: test
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 much more experienced with the formulation and mathematical expression of selected problems in mechanics.

Class syllabus:
Translational motion. Rotational motion. Newton's laws of dynamics, force, momentum. Gravitational field. Work, kinetic and potential energy, moment of force, angular momentum. Conservation laws in mechanics. Rigid body mechanics, center of gravity, moment of inertia, Steiner's theorem, rotational motion. Fluid mechanics. Oscillations - free, damped and driven, resonance.

Recommended literature:
Fyzika1 / David Halliday, Robert Resnick, Jearl Walker. Brno: VUTIUM, 2013
Fyzika v príkladoch / Vladimír Hajko. Bratislava : Slovenské vydavateľstvo technickej literatúry, 1967

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 93

A	B	C	D	E	FX
74,19	10,75	8,6	2,15	3,23	1,08

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 09.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-182/22	Complementary Exercises in Mathematical Methods in Physics (1)

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

Number of credits: 1

Recommended semester: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary assessment: papers
It is necessary to obtain at least 90% of points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% of points to grade D and at least 50% to grade E.
Scale of assessment (preliminary/final): Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will gain skills and experience in the mathematical apparatus needed to master the course in Mathematical Methods in Physics (1)

Class syllabus:
Complementary exercises for the subject Mathematical Methods in Physics (1). The course will practice more simple examples of this subject.
Scalars and vectors, operations of their use in physics. Complex numbers and their use. Integrals (methods of integration - modifications, per partes, substitution). Applications of integrals in physical practice, the principle of superposition (calculation of centers of gravity, moments of inertia, potentials of conservative fields, forces acting between bodies of different shapes). Series (Taylor and Mac Laurin series, Fourier series). Differential equations.

Recommended literature:
Matematika pre fyzikov / A. Grega, D. Kluvanec, E. Rajčan. Bratislava : Slovenské pedagogické nakladateľstvo, 1974
Matematický aparát fyziky / Jozef Kvasnica. Praha : Academia, 1997
Matematické metody ve fyzice a technice / John Warren Dettman ; přeložil Jiří Langer ; vedec. red. Miroslav Brdička. Praha : Academia, 1970

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
56,25	18,75	12,5	0,0	12,5	0,0

Lecturers: doc. RNDr. Radoslav Böhm, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-183/22	Complementary Exercises in Mathematical Methods in Physics (2)

Educational activities:
Type of activities: practicals
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: I., I.II.

Prerequisites:

Course requirements:
Preliminary assessment: papers
It is necessary to obtain at least 90% of points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% of points to grade D and at least 50% to grade E.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will gain skills and experience in the mathematical apparatus needed to master the course in Mathematical Methods in Physics (2)

Class syllabus:
Complementary exercises for the subject Mathematical Methods in Physics (2). The course will practice more simple examples of this subject.
Multiple variable functions. Multidimensional integrals and their use in physics. Coordinate systems (polar, cylindrical, spherical - volume and area elements, determination of velocities, accelerations in various bases). Curve integrals. Basics of vector analysis. Einstein's summation convention. Basics of statistics. Partial differential equations.

Recommended literature:
Matematika pre fyzikov / A. Grega, D. Kluvanec, E. Rajčan. Bratislava : Slovenské pedagogické nakladateľstvo, 1974
Matematický aparát fyziky / Jozef Kvasnica. Praha : Academia, 1997
Matematické metody ve fyzice a technice / John Warren Dettman ; přeložil Jiří Langer ; vedec. red. Miroslav Brdička. Praha : Academia, 1970

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 9					
A	B	C	D	E	FX
55,56	33,33	0,0	0,0	11,11	0,0
Lecturers: doc. RNDr. Radoslav Böhm, PhD.					
Last change: 22.06.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-521/15	Computer Modelling

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

Number of credits: 3

Recommended semester: 3.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: programming a selected model of a real-life problem
Final exam: oral / written oral exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
The graduate of the course will handle the basics of creating a description of real systems and their transformation into a model. He/she can implement individual parts of the systems and the relationships between them in a computer simulation environment and analyze the obtained simulation results.

Class syllabus:
Defining basic concepts, creation of mathematical models, advantages and disadvantages of models, characterization of system parts and their interactions, work in GNU Octave/Matlab, use of the program in numerical solution of problems of mathematical analysis, linear algebra and differential equations, visualization of model outputs, data analysis, Monte Carlo simulations, simulations of systems with N moving particles, simulations of connections between system entities.

Recommended literature:
Matlab / Jela Babušíková. Bratislava : Knižničné a edičné centrum FMFI UK, 2007
Physical Modeling in Matlab / Allen B. Downey. Needham : Green Tea Press 2011 https://greenteapress.com/wp/physical-modeling-in-matlab/
An Introduction to Computer Simulation Methods: Applications To Physical Systems / Harvey Gould, Jan Tobochnik, Wolfgang Christian, San Francisco: Pearson, 2007, ISBN 0-8053-7758-1

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 41

A	B	C	D	E	FX
97,56	2,44	0,0	0,0	0,0	0,0

Lecturers: RNDr. Ing. Milan Melicherčík, PhD., RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD., Mgr. Šimon Šutý, PhD.

Last change: 09.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 148

A	B	C	D	E	FX
95,95	4,05	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 10.

Educational level: I.II., 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: 150

A	B	C	D	E	FX
98,67	0,67	0,67	0,0	0,0	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
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: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.	

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 10.

Educational level: I.II., 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: 150

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 35

A	B	C	D	E	FX
68,57	17,14	14,29	0,0	0,0	0,0

Lecturers: doc. RNDr. Mgr. Katarína Kozlíková, CSc.
Last change: 28.01.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 13

A	B	C	D	E	FX
61,54	7,69	7,69	7,69	15,38	0,0

Lecturers: Mgr. Katarína Čechová, PhD.

Last change: 10.01.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-FYZ-217/22	Electromagnetism

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: 3.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: written work
Exam: oral + written
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
By completing the course, the student will understand the basic laws applicable to electric and magnetic fields and will be able to apply them in solving problems.

Class syllabus:
Electrostatics of charges in vacuum, in the presence of conductors and in dielectrics. Coulomb's law, Gauss's law, electric potential, calculation of electric fields. Electric current, Ohm's law, Kirchhoff's laws. Magnetism and electric currents. Biotov-Savart-Laplace law, Ampere's law, magnetic vector potential, magnetic field in magnetic material, calculation of magnetic fields. Electromagnetic induction, Lenz's rule, inductance and mutual inductance. Alternating electric currents, RLC circuits. Relativity of electric and magnetic field. Electromagnetic waves, Poynting vector.

Recommended literature:
A. Tirpák: Elektromagnetizmus. Iris (2011)
D. Halliday, R. Resnick, J. Walker: Fyzika 1-5, Akademické nakladatelství VUTIUM (2007)

Languages necessary to complete the course:
Slovak / English (study literature in Slovak or English)

Notes:

Past grade distribution
Total number of evaluated students: 93

A	B	C	D	E	FX
27,96	10,75	15,05	9,68	19,35	17,2

Lecturers: doc. RNDr. František Kundracik, CSc., Mgr. Róbert Astaloš, PhD., doc. RNDr. Radoslav Böhm, PhD.
Last change: 14.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 5., 7., 9.

Educational level: I., I.II., 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: 291

A	B	C	D	E	FX
75,26	9,62	4,81	1,37	1,03	7,9

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 6., 8., 10.

Educational level: I., I.II., 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: 201

A	B	C	D	E	FX
82,09	8,96	2,49	1,0	0,0	5,47

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-131/00	English 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., I.II.

Prerequisites:

Course requirements:
Grades: A 93%, B 85%, C 77%, D 70%, E 65%
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:
The objective of the subject is to provide the students with experience and knowledge of technical English and thus make them ready to use English sources of information for later study and professional career.

Class syllabus:
On entering the first semester, students´ knowledge of English is tested and they are divided into groups according to the results of the placement test. In the groups of pre-intermediate and intermediate students, fundamentals of technical English are taught. Advanced students take classes of technical English for their field of study: English for mathematics, for physics, for computer science, English for management and economic and financial mathemathics.

Recommended literature:
Anglický jazyk pre študentov FMFI UK : Kurz pre mierne pokročilých / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Aplikovaná matematika / Alexandra Maďarová, Ľubomíra Kožehubová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Matematika / kolektív autorov KJP.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Fyzika / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Informatika / Elena Klátiková.
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 7132

A	B	C	D	E	FX
29,54	23,11	18,17	12,56	7,84	8,78

Lecturers: Mgr. Eva Foltánová, Mgr. Ing. Jana Kočvarová, Mgr. Ľubomíra Kožehubová, Mgr. Alexandra Maďarová, PhDr. Alena Zemanová, Mgr. Aneta Barnes, Mgr. Simona Dobiašová, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-132/00	English 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., I.II.

Prerequisites:

Course requirements:
Grades: A 93%, B 85%, C 77%, D 70%, E 65%
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:
The objective of the subject is to provide the students with experience and knowledge of technical English and thus make them ready to use English sources of information for later study and professional career.

Class syllabus:
This is a continuation of the course English (1) designed for pre-intermediate students. Fundamental vocabulary is presented through selected topics in mathematics, physics and informatics. The lessons also contain revision of elementary grammar. Generally, it is a necessary preliminary to advanced programs.

Recommended literature:
Anglický jazyk pre študentov FMFI UK : Kurz pre mierne pokročilých / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1733

A	B	C	D	E	FX
22,1	20,95	23,83	14,77	11,08	7,27

Lecturers: PhDr. Alena Zemanová, Mgr. Ing. Jana Kočvarová, Mgr. Alexandra Maďarová, Mgr. Ľubomíra Kožehubová, Mgr. Eva Foltánová, Mgr. Aneta Barnes, Mgr. Simona Dobiašová, PhD.
Last change: 20.06.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-231/00	English 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., I.II.

Prerequisites:

Course requirements:
Grades: A 93%, B 85%, C 77%, D 70%, E 65%
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:
The objective of the classes is to provide the students with knowledge of technical English in their field of study and experience with technical English sources sufficient to make the able to use technical language for their later study and professional purposes.

Class syllabus:
The subject continues the program of English (2). Students take classes of special English for their field of study: English for mathematics, English for physics, English for computer science, English for management and economic and financial mathemathics.
The subject requires advanced knowledge of general English.

Recommended literature:
Anglický jazyk pre študentov FMFI UK : Kurz pre mierne pokročilých / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Aplikovaná matematika / Alexandra Maďarová, Ľubomíra Kožehubová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Matematika / kolektív autorov KJP.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Fyzika / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Informatika / Elena Klátiková.
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1422

A	B	C	D	E	FX
15,47	19,06	22,78	18,35	18,0	6,33

Lecturers: PhDr. Alena Zemanová, Mgr. Ing. Jana Kočvarová, Mgr. Alexandra Maďarová, Mgr. Ľubomíra Kožehubová, Mgr. Eva Foltánová, Mgr. Aneta Barnes, Mgr. Simona Dobiašová, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-232/10	English 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., I.II.

Prerequisites:

Course requirements:
Examination: an examination consisting of a written and an oral part.
Grades: A 93%, B 85%, C 77%, D 70%, E 65%
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/skuska-z-predmetu-anglicky-jazyk-4/
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, students will be able to work independently with professional literature in English

Class syllabus:
Students take classes of special English for their field of study: English for mathematics, English for physics, English for computer science, English for management and economic and financial mathemathics.

Recommended literature:
Anglický jazyk pre študentov FMFI UK : Kurz pre mierne pokročilých / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Aplikovaná matematika / Alexandra Maďarová, Ľubomíra Kožehubová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Matematika / kolektív autorov KJP.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Fyzika / Alena Zemanová.
The textbook has not been published. It is at students' disposal in an electronic format.
Anglický jazyk pre študentov FMFI UK : Informatika / Elena Klátiková.
The textbook has not been published. It is at students' disposal in an electronic format.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 4292

A	B	C	D	E	FX
25,19	28,1	21,6	11,84	6,06	7,22

Lecturers: Mgr. Ing. Jana Kočvarová, Mgr. Alexandra Maďarová, PhDr. Alena Zemanová, Mgr. Ľubomíra Kožehubová, Mgr. Eva Foltánová, Mgr. Aneta Barnes, Mgr. Simona Dobiašová, PhD.

Last change: 17.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 154

A	B	C	D	E	FX
67,53	25,32	5,19	1,3	0,0	0,65

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

Last change: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 153					
A	B	C	D	E	FX
62,75	29,41	6,54	1,31	0,0	0,0
Lecturers: Mgr. Katarína Čechová, PhD., doc. RNDr. Pavol Vitovič, PhD.					
Last change: 14.03.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

Last change: 12.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-FYZ-401/22	Fields of Physical Research

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: 2

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
The student will have an overview of modern research at FMFI UK, which will allow him to decide in which area of physics he wants to continue his master's degree, or to gain a broader view of physics.

Class syllabus:
Each week a lecture from one of the modern directions of research at the faculty.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 256

A	B	C	D	E	FX
98,05	0,39	1,56	0,0	0,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 24.02.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚLChB/1-BMF-255/00	Foundations of Biochemistry

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: 4.

Educational level: I., I.II.

Prerequisites: FMFI-LF.ÚLChB/1-BMF-220/00 - Foundations of Chemistry in Living Systems

Course requirements:
Preliminary evaluation: Active participation in practical exercises, elaboration and submission of protocols, passing continuous tests
Final exam: written exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The student will gain knowledge of biochemical processes and the principles of regulation in a living organism. Acquired knowledge will include practical application of knowledge gained in the course Foundations of Chemistry in Living Systems; gaining knowledge of principal biochemical and metabolic processes in the cell under physiological and selected pathological conditions; the ability to understand basic regulations of molecular processes and pathological causations of selected diseases. Student will also gain practical skills in the various laboratory methods employed in clinical diagnostic procedures and will be able to understand the principles of evaluation the laboratory results achieved during experimental laboratory practices.

Class syllabus:
Biological oxidations in living systems as the essential process for energy production. ATP formation in mitochondria, terminal oxidation, oxidative phosphorylation. Formation and utilization of acetyl-CoA, citrate cycle, the importance of the citrate cycle in cell energy production and in the process of gluconeogenesis. Carbohydrate metabolism, glycolysis, gluconeogenesis, pentose cycle, glycogen metabolism. Lipid metabolism, degradation and synthesis of higher carboxylic acids, formation of simple and complex lipids, lipoprotein metabolism. General reactions of amino acid metabolism, deamination and transamination, ammonia detoxification, urea synthesis. Metabolism of purine and pyrimidine nucleotides. General mechanisms of signal processes and regulation of metabolism. Involvement of hormones and other signalling molecules in the regulation of processes in the cell.

Recommended literature:

Lekárska biochémia I. / Kolektív autorov. Bratislava, UK, 2016
Lekárska biochémia: seminárna a praktická časť / Kolektív autorov. Bratislava, UK, 2016
Lekárska biochémia II. / Ladislav Turecký. Bratislava: Asklepios, 2014

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: 193

A	B	C	D	E	FX
18,13	12,95	17,1	20,73	22,8	8,29

Lecturers: doc. Ing. Mária Chomová, PhD., doc. RNDr. Monika Ďurfinová, PhD., prof. RNDr. Jana Muchová, PhD., prof. Ing. Ingrid Žitňanová, PhD., prof. MUDr. Ladislav Turecký, CSc.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚLChB/1-BMF-220/00	Foundations of Chemistry in Living Systems

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: 3.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation:
semester work– PowerPoint presentation; laboratory protocols, weekly tests
Final exam: written exam consisting of 3 parts (50 questions) 35 test questions, 10 creative questions and 5 calculations
Indicative evaluation scale: A 90%, B 80%, C 70%, D 65%, E 60%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The student will gain knowledge of the foundations of chemistry in biomedical applications. He will be familiar with the structure, properties and biological function of important biogenic substances, some pathophysiological processess in the human body, such as oxidative stress, glycation, glycooxidation and inflammation, and the toxicity of inorganic and organic compounds. A student acquires the following skills: the ability to apply knowledge in a comprehensive understanding of metabolic processes and the principles of their regulation in the human body, as well practical skills in the field of physico-chemical and biochemical laboratory methods employed in a laboratory and clinical practice.

Class syllabus:
Lectures: Chemical bonding. Biogenic elements. Overview and principle of physico-chemical methods. Dispersion systems. Solutions. Chemical equilibrium in solutions of acids and bases. Characteristics of oxidation-reduction processes. Energetics and kinetics of chemical processes. Structure and properties of organic compounds. Hydrocarbons. Structure and biochemically important organic compounds of sulfur, nitrogen. Carbohydrates. Lipids. The importance of lipids in nutrition. Arachidonic acid. Terpenes. Steroids. Alkaloids. Amino acids. Peptides. Proteins. Polynucleotides. Nucleic acids. Nucleoproteins. Enzymology. Vitamins. Enzymes, importance of enzymology, multienzyme systems. Laboratory practices: Principles of physico-chemical methods (spectrophotometry, potentiometry, chromatography) and their application in laboratory diagnostics. Determination of selected metal ions in plasma, determination of their effect on erythrocyte fragility. Preparation of solutions, measuring and evaluation of the pH of body fluids.

Qualitative and quantitative determination of important physiological and pathological metabolites (urea, glucose, ketone bodies, total lipids, malondialdehyde). Thin layer and gel chromatography of amino acids and proteins. Determination and calculation of enzyme activity, monitoring the impact of various factors.

Recommended literature:
Lekárska chémia / Jana Muchová a kol. UK Bratislava, 2012, ISBN 978-80-223-3199-9

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: 210

A	B	C	D	E	FX
7,62	11,43	22,86	18,1	31,9	8,1

Lecturers: RNDr. Lucia Andrezálová, PhD., prof. Ing. Zdeňka Ďuračková, PhD., doc. Ing. Mária Chomová, PhD., prof. RNDr. Jana Muchová, PhD., prof. Ing. Ingrid Žitňanová, PhD., Mgr. Monika Dvořáková, PhD., RNDr. Zuzana Országhová, PhD., RNDr. Zuzana Paduchová, PhD., Mgr. Mária Janubová, PhD., Ing. Miriama Ježovičová, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I., I.II., 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: 482

A	B	C	D	E	FX
48,76	19,09	17,01	8,09	2,07	4,98

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I., I.II., 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: 307

A	B	C	D	E	FX
45,6	22,48	16,94	8,79	2,28	3,91

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 9.

Educational level: I., I.II., 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: 120

A	B	C	D	E	FX
45,83	25,83	18,33	5,83	0,83	3,33

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 10.

Educational level: I., I.II., 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: 79

A	B	C	D	E	FX
43,04	32,91	16,46	2,53	1,27	3,8

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-541/25	Fundamentals of Research Methodology in Biomedicine

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: 5.

Educational level: I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: active individual work, presentation of individual parts of a selected reserch project
Final exam: oral / written presenting bachelor thesis project
Scale of assessment (preliminary/final): Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50% Scale of assessment (preliminary/final): 80/20

Learning outcomes:
By completing the course, the students will master the basic principles of scientific research methodology. The students will learn to search, assess and process information retrieved from the scientific databases. When designing a project, they apply the knowledge gained in the course Introduction to Biostatistics and propose a procedure for evaluating the results obtained in the practical part of a chosen research problem within the framework of ongoing research projects or internships. The student will learn the basic principles of making presentations, become familiar with presentation techniques and practice presentation skills.

Class syllabus:
Research and design, legislation and ethical aspects of biomedical research. Anatomy of a research project on examples. The structure of the bachelor's thesis project proposal, the definition of the research area and the research question(s). Active search of professional literature in academic and internet libraries, assessment of professional literature in terms of content and methodology, processing of information from scientific and professional literature, assessment of design of the protocol (partial tasks) in accordance with the objectives of the bachelor's thesis. Statistical Analysis Plan (SAP) in accordance with the proposed design. Time aspect of the project, resources (financial, human, infrastructure, material). SWOT analysis. Practical part: presentation of the bachelor thesis project and protocol.
Continuous communication with teachers, research project leaders, practice consultants and with the guarantor.

Recommended literature:

Hulín Ivan et al. Úvod do vedeckého bádania 1. (2003). Bratislava : SAP, 557 s. ISBN 80-89104-29-0
Dillon Patrick F. Biophysics : a physiological approach. (2012). Cambridge : Cambridge University Press, 314 p. ISBN 978-0-521-17216-5.
Nadeau Jay. Introduction to experimental biophysics: Biological methods for physical scientists. (2012). Boca Raton : CRC Press, 641 p. ISBN 978-1-4398-2953-0.
D. Shi (Ed.). Biomedical devices and their applications. (2004). Berlin : Springer, 201 p. eBook ISBN 978-3-662-06108-4.
Katina S., Králík M., Hupková A. (2015). Vedecké štúdie. V: Aplikovaná štatistická inferencia I. 1 vydanie. Masarykova univerzita Brno, 1-32 s. /306 s. ISBN 978-80-210-7841-3.
Gavora Peter. Sprievodca metodológiou kvalitatívneho výskumu. (2007). Bratislava : Univerzita Komenského, 229 s. ISBN 978-80-223-2317-8.
Waczulíková, I., Slezák, P. (2015). Introductory Biostatistics. Bratislava: Comenius University, 1st Edition. 147 p. ISBN 978-80-223-3938-4.

Languages necessary to complete the course:
Slovak in combination with English (scientific literature)

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: prof. RNDr. Iveta Waczulíková, PhD.

Last change: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-335/15	Fundamentals of Biomedical Physics

Educational activities:
Type of activities: lecture / seminar
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: 5.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: active seminar presentation, homework
Exam: written
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
The graduate of the course knows the physical principles of physiological processes at various levels of the organization and the basic physical methods used for the study of biological objects with a focus on applications in medicine.

Class syllabus:
Relationship between physics, biology and medicine. Biomechanics - static force, friction, translation and rotating motion on the human body. Elasticity and strength of biomaterials. Fluids and fluid movement - blood circulation. Heat and kinetic energy. Electricity and electrical technologies - electrical signals in the human body. Optics - vision. Nanotechnology

Recommended literature:
Physics in biology and medicine / Paul Davidovits. San Diego : Harcourt Academic Press, 2001
Physics of the Human Body / Irving P. Herman. New York, Springer, 2016
Intermediate Physics for Medicine and Biology / Russell K. Hobbie, Brandley J. Roth. Minnesota, Springer, 2015

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 73

A	B	C	D	E	FX
57,53	23,29	13,7	4,11	1,37	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc., Mgr. Zuzana Garaiová, PhD., Mgr. Veronika Šubjaková, PhD., RNDr. Marcela Morvová, PhD., Mgr. Marek Tatarko, PhD.
Last change: 21.06.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-955/25	**Course title:** Fundamentals of Physics
Number of credits: 2	
Educational level: I.II.	
Course requirements: Final exam: State examination Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The condition for passing the course is successful completion of the state examination	
Class syllabus: 1. Newton laws of dynamics, constant and acerated motion 2. Oscillations of a linear harmonic oscillator: undamped, damped 3. Forced oscillations, resonance 4. Mechanical energy, work, power, conservation laws (energy, momentum, angular momentum) 5. Basic laws of hydrostatics, hydrodynamics and their applications (Pascal's law, Archimedes' law, Bernoulli's equation, continuity equation) 6. Electric charge, electric field intensity, electric charge density. 7. Gauss's law and its use to calculate the electric field in symmetric cases. 8. Electrostatic field of a dipole and force effects of an electric field on a dipole. 9. Electric field around conductors and in their cavities. The relationship between the intensity of the electric field and the surface charge density. 10. Ampere's law and its use for calculation of magnetic fields in symmetric cases. 11. Electromagnetic induction, Lenz's law. 12. Basic properties of electromagnetic waves. Poynting vector. Light intensity. 13. Polarization of light (Fresnel equations, Brewster angle). Realization of polarized waves. 14. Interference of light waves (Beam coherence - methods for producing two coherent light sources) 15. Diffraction (Huygens-Fresnel principle, slit, difraction grating). 16. Rutherford scattering 17. X-rays 18. Bohr model of hydrogen atom and radiation spectra 19. Nuclear binding energy (Weizsäcker formula, applications) 20. Statistical law of radioactive decay 21. Alpha decay of nuclei, beta decay 22. Mechanisms of ionizing radiation interaction with matter. 23. Interaction of gamma radiation with matter 24. Physical principles of particle detection. 25. Continuous random variables. Probability density function. Expected value and mean squared deviation. State two examples of probability density functions. 26. The Drunkard's Walk. Dependence of the mean square of the distance on the number of steps.	

27. Maxwell's velocity distribution. The most probable value of the velocity and the average squared velocity.
28. Boltzmann distribution. Barometric formula.
29. The first law of thermodynamics for an ideal gas. Mayer's relationship.
30. Carnot cycle.
31. Gas work (isochoric, isobaric, isothermal, adiabatic process)
32. Gas entropy increment (isochoric, isobaric, isothermal, adiabatic process).
33. Two-state system (spin) at temperature T. Average energy.
34. Grand canonical distribution (Bose-Einstein distribution, Fermi-Dirac distribution).
35. Canonical ensemble. Statistical sum. Calculation of the expected value of energy from the statistical sum.
36. Passage of particles through the barrier - quantum tunnelling (importance in biology).

State exam syllabus:

Recommended literature:
Recommended study literature

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

Last change: 23.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/1-DAV-201/20	Fundamentals of Probability and Statistics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: I., I.II., II.

Prerequisites:

Antirequisites: FMFI.KAMŠ/2-INF-175/18

Course requirements:
Teaching period: written exams
Examination period: combined written and oral exam
Examination period weight: 70%
Evaluation (in %): A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), Fx (50-0)
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After finishing the course the students understand the mathematical foundations of probability and statistics. They can solve the most common types of probabilistic problems and execute the simplest statistical analyses.

Class syllabus:
Random events and probability, Independence of events, Conditional probability, General random variables, Distribution function, Discrete random variables and their basic types, Continuous random variables and their basic types, Numerical characteristics of random variables (for instance the mean value and the variance), Random vectors, Correlation and dependence of random variables, Law of large numbers, Central limit theorem, Introduction to the random variates generation, Introduction to the probabilistic information theory, Statistical inference for the simple random sample, Statistical inference for a pair of random samples, Statistical inference for the regression line, The fundamental principle of Monte-Carlo methods.

Recommended literature:
Probability and random processes / Geoffrey R. Grimmett, David R. Stirzaker. Oxford : Oxford University Press, 2001
Electronic materials of the lecturer

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 632

A	B	C	D	E	FX
19,3	11,23	15,03	21,52	22,63	10,28

Lecturers: doc. Mgr. Radoslav Harman, PhD., Mgr. Pál Somogyi, doc. Mgr. Lenka Filová, PhD., Dr. rer. nat. Tatiana Kossaczká, MSc.

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-FYZ-212/15	Fundamentals of Programming

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: 3.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Exam: practical (programming)
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The student will understand the principles of computer processing of numbers and the resulting limitations (data types, including links, number fields). They will understand the basic structures of the program (functions, branches, ...) and their use to algorithmize problem solving. They will be able to program in C / C ++ language simpler algorithms for solving mathematical and physical problems (eg movement in fields, calculation of fields, sums of rows, ...).

Class syllabus:
Basic structure of C / C ++ program, data types and their accuracy, program branching (if..else, switch, for, while, do..while), functions, use of references to return multiple values of functions, two- and multidimensional fields, texts , field references, data flows and their control (cin, cout), working with files (fstream), concept of object, drawing simple graphs from C ++ program (xmgrace, GNUplot), Euler's method for solving differential equations and its use for solving motion problems , roots of functions, numerical integration and its use for solving physical problems, random numbers and Monte Carlo methods, basics of object-oriented programming.

Recommended literature:
Kundracik, F .: Basics of Programming Practically. Vydavateľstvo UK 2013. On-line: http:// www.fmph.uniba.sk/index.php?id=3246
Materials on the course page: http://davinci.fmph.uniba.sk/~kundracik1/ZakladyProgramovania/

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 368					
A	B	C	D	E	FX
58,7	6,79	10,6	8,7	8,97	6,25
Lecturers: doc. RNDr. František Kundracik, CSc., doc. RNDr. Peter Papp, PhD.					
Last change: 24.06.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I., I.II., 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: 828

A	B	C	D	E	FX
37,56	25,48	18,6	9,18	2,78	6,4

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

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I., I.II., 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: 541

A	B	C	D	E	FX
37,89	19,59	19,59	12,38	3,51	7,02

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

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 9.

Educational level: I., I.II., 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: 184

A	B	C	D	E	FX
44,02	23,91	20,11	6,52	2,17	3,26

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

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 10.

Educational level: I., I.II., 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: 104

A	B	C	D	E	FX
44,23	22,12	14,42	10,58	3,85	4,81

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

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAG/1-INF-240/15	Graphical Systems, Visualization, Multimedia

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

Number of credits: 4

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Recommended prerequisites:
The class does not require content prerequisites.

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

Learning outcomes:
The content of the course provides, in accordance with the recommendations of the ACM Computing Curriculum, basic knowledge in the areas of Graphics and Visual Computing, Human-Computer Interaction, and relevant topics for Social and Professional Issues.
Graduates will be able to create digital content with freely available tools in the field of computer graphics and scientific and visualization.

Class syllabus:
- Reference model of computer graphics, architecture of multimedia system, methodology of mathematical modeling and visualization, application areas of computer graphics, visualization and multimedia. International standardization (ISO, Web Consortium, EU standards). Visual computing - brief history, social implications, economic and copyright aspects. Intellectual Property.
- Graphic communication. Geometric modeling (creation of simple objects). Basics of rendering. Use of API (OpenGL). HCl. Basics of human-machine communication. Design of a simple interactive graphical interface (GUI).
- Physical and logical input devices. GUI programming. Interactive aspects of multimedia systems and communication. Coding of graphic and multimedia information. Data compression principle. Functional standards for computer graphics and image processing. Web consortium. De facto standards (OpenGL, window systems). Graphics system and GUI functionality specification. Coordinate systems. Homogeneous coordinates. Affine transformations (scaling, rotation, translation). Implement a simple display channel. Line clipping and rasterization (DDA, Bresenham algorithm).

- Implementation of basic 2D graphic elements: polyline, fill area, text. Image hierarchy and 2D computer animation. Simple color models (RGB, CMYK). The cultural significance of some. colors. Website design. Using text in pictures. Web publishing.
- Human perception. Analog and digital representations for multimedia. Image and sound processing. Basic functions for visualization. History of visualization. Visualization scenarios. Interactive multimedia titles. Introduction to 3D graphics. Visibility problem and z-buffer. Light sources. Parameters of camera. Scene graph. VRML standard. Interaction of light and objects. Local lighting model and shading (constant, Gouraud, Phong). Textures. Photorealistic rendering.
- 3D scene modeling. Parametric and implicit representation. CSG and B-rep. Procedural modeling (fractals and particle systems).
- Computer. animation. Computer games and virtual reality. Scanning, modeling and display of medical data.

Recommended literature:

Computer graphics and image processing (in Slovak) / Eugen Ružický, Andrej Ferko. Bratislava: Sapientia, 1995. [online] http://www.sccg.sk/~ferko/PGASO2012-bookmarks.pdf
Fundamentals of interactive computer graphics / James D. Foley, Andries van Dam. Reading: Addison-Wesley, 1983
Class materials available from the class website.

Languages necessary to complete the course:
English, Slovak

Notes:
The class is eventually taught in a distant mode, as well.

Past grade distribution
Total number of evaluated students: 1112

A	B	C	D	E	FX
24,91	26,35	21,67	11,33	7,46	8,27

Lecturers: doc. RNDr. Andrej Ferko, PhD.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚHE/1-BMF-160/00	Histology (1)

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

Number of credits: 3

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
The student has a good theoretical knowledge of the basics of cytomorphology and general histology. Masters the basic laboratory examination methods used in histology.

Class syllabus:
Introduction to histology, histological technique. Cytology (light and electron microscopy). Epithelial tissues (covering, lining). Supportive and connective tissues (ligaments, cartilage). Blood and hematopoiesis. Muscle tissue (smooth, transverse striated muscle, heart muscle, differential diagnosis). Nervous tissue (neurons, nerve fibers, neuroglia, supporting tissue). Organ systems (microscopic anatomy of the cardiovascular system - heart, arteries, veins, capillaries).

Recommended literature:
Histológia pre poslucháčov biomedicínskej fyziky / Jana Foltinová. Univerzita Komenského, 2012
Histologie / Renate Lullmann Rauch. Grada 2013, ISBN 9788024737294
Langmanova lékařská embryologie / Thomas W. Sadlaer. Grada 2011, ISBN 978802476403
Netters Essential Histology / Wililiam K. Ovalle. Elsevier Saunders 2013, ISBN 9781455706310
Wheater's Functional Histology, A text and colour atlas / Barbara Young. Elsevier 2013, ISBN 9780702047473
Before we are Born / Keith L. Moore. Elsevier 2013, ISBN 9781437720013

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 238

A	B	C	D	E	FX
13,87	18,49	26,89	21,85	18,49	0,42

Lecturers: prof. MUDr. Štefan Polák, CSc., MUDr. Vanda Rísová, PhD., prof. RNDr. Ivan Varga, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚHE/1-BMF-225/00	Histology (2)

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

Number of credits: 4

Recommended semester: 3.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
The student has a good theoretical knowledge of the basics of cytomorphology, general histology, microscopic anatomy of organs and human embryogenesis. He masters basic special laboratory examination methods used in histology such as histochemistry, immunohistochemistry, scanning electron microscopy, transmission microscopy, confocal microscopy. The student will gain advanced knowledge of the microscopic structure of the human body, which leads to an understanding of functional processes.

Class syllabus:
Microscopic anatomy of the lymphatic system. Microscopic anatomy of endocrine glands. Microscopic anatomy of the respiratory system. Microscopic anatomy of the digestive system. Microscopic anatomy of the uropoietic system. Microscopic anatomy of male and female genitals. Microscopic anatomy of the skin and additional skin organs. Microscopic anatomy of central and peripheral nervous system organs. Microscopic anatomy of sensory organs. Microscopic anatomy of selected embryological structures.

Recommended literature:
Histológia pre poslucháčov biomedicínskej fyziky / Jana Foltinová. Univerzita Komenského, 2012
Histologie / Renate Lullmann Rauch. Grada 2013, ISBN 9788024737294
Langmanova lékařská embryologie / Thomas W. Sadlaer. Grada 2011, ISBN 978802476403
Netters Essential Histology / Wililiam K. Ovalle. Elsevier Saunders 2013, ISBN 9781455706310
Wheater's Functional Histology, A text and colour atlas / Barbara Young. Elsevier 2013, ISBN 9780702047473

Before we are Born / Keith L. Moore. Elsevier 2013, ISBN 9781437720013Before we are Born / Keith L. Moore. Elsevier 2013, ISBN 9781437720013

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 198

A	B	C	D	E	FX
34,34	25,76	16,67	10,61	10,1	2,53

Lecturers: prof. MUDr. Štefan Polák, CSc., MUDr. Vanda Rísová, PhD., prof. RNDr. Ivan Varga, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-MXX-491/22	Inclusive Approaches to Education of Students with Special Educational Needs

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: 1., 3.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: active participation in class (elaboration of assigned tasks, participation in discussions)
An exam: -
Indicative assessment level: e.g. A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The student:
- They will get acquainted with the basic characteristics of types of health disadvantage (HR) and will know the consequences of HR on education.
- Gain personal experience from meetings with people with disabilities and will be able to explain and apply the rules of communication with them.
- Can characterize the forms of education of students with SEN and assess the possibilities of their pedagogical, technical and human support, which positively affect the success of education.

Class syllabus:
- Characteristics of basic concepts.
- Disability models.
- Disability legislation.
- Human, communication, information and architectural barriers.
- Impact of disability on education.
- Segregation - integration - inclusion.
- Information access technologies for people with disabilities.
- Possibilities and limits of creating equal conditions for the education of pupils with specific educational needs.
- Inclusive school - education for all.
- The importance of education for the social inclusion of people with disabilities.

Recommended literature:

- Lechta, V. (ed): Inkluzivní pedagogika. Praha: Portál, 2016, ISBN 978-80-262-1123-5
- Slowík, J.: Komunikace s lidmi a postižením. Praha: Portál, 2010, ISBN 978-80-7367-691-9
- Kol. autorov: Od integrácie k inklúzii. VÚDPaP: Bratislava, 2018, ISBN 978-80-89698-27-1

Languages necessary to complete the course:
Slovak

Notes:

Past grade distribution
Total number of evaluated students: 105

A	B	C	D	E	FX
74,29	20,0	3,81	0,0	0,0	1,9

Lecturers: Mgr. Ľudmila Hlinová

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 153

A	B	C	D	E	FX
67,32	21,57	9,15	1,31	0,65	0,0

Lecturers: Mgr. Katarína Čechová, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-311/15	Introduction to Biophysics

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: 5.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
To show the students how the processes taking place in living organisms can be explained using physics

Class syllabus:
Structure and physical properties of biopolymers - nucleic acids, proteins and polysaccharides. DNA discovery, genes. Biological membranes - structure and function. Physics of nerve impulse generation and generation. Biomechanics, elasticity of biomaterials. Physics of respiration. Physics of blood circulation, space medicine. Biological optics, thermovision. Biological acoustics. Orientation of animals in electromagnetic fields and using ultrasound. Thermodynamics, bioenergetics. Molecular machines and nanobiotechnology. Evolution. Modern physical methods in biophysical research.
Solving physical examples associated with the mechanisms of processes in living organisms.

Recommended literature:
Biophysics : An introduction / Roland Glaser. Heidelberg : Springer, 2012
Biomedical applications of introductory physics / Jack A. Tuszynski, John M. Dixon. Hoboken, N.J. : Wiley, 2002
Elementary biophysics : An introduction / P K Srivastava. Harrow : Alpha Science International, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 35

A	B	C	D	E	FX
65,71	22,86	0,0	0,0	2,86	8,57

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

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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. Radoslav Böhm, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-216/22	Introduction to Programming

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: 3

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary assessment: elaboration of assigned programs
Exam: oral / written
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will acquire basic programming skills in the Python programming language, they will get acquainted with the basic data structures of the language, they will acquire the first programming skills.

Class syllabus:
Variables, data types, cycles, conditions, functions, working with files, recursion, working with graphics

Recommended literature:
Pigrim M. Ponořme se do Pythonu 3 https://www.root.cz/knihy/ponorme-se-do-pythonu-3/
Downey A. Think Python https://www.root.cz/knihy/think-python/
Summerfield: Python 3: Výukový kurz, Computer Press 2010
Miller: How to Think Like a Computer Scientist: Interactive Edition, http://interactivepython.org/runestone/static/thinkcspy/index.html

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: RNDr. Ing. Milan Melicherčík, PhD., Mgr. Ivan Sukuba, PhD.

Last change: 13.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-331/25	Introductory Biostatistics

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: 4.

Educational level: I.II.

Prerequisites:

Recommended prerequisites:
-

Course requirements:
Preliminary evaluation: 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): 20/80

Learning outcomes:
On completion of the course, students will gain knowledge of the basic principles of scientific research methodology - they will be able to identify and apply different research types, and research designs. They will master the most commonly used statistical methods for biological and clinical data analysis and be able to work with statistical software and Excel add-ins.

Class syllabus:
Basic principles of statistical thinking. Probability, random variable and its characteristics, types of probability distributions, basic concepts of applied statistics. Data collection, cleaning, sorting and coding, types, scales of variables, descriptive statistics, summarisation and presentation of data. Point and interval estimates, the concept of statistical hypothesis testing, P-value, interpretation of hypothesis testing results, statistical and biological significance. Analysis of categorical data, proportions, contingency tables, case classification, diagnostic tests. Comparison of sample means, t-tests. Analysis of variance. Nonparametric methods. Correlation and simple linear regression. Introduction to multivariable analysis. Practical part: solving real biomedical problems using statistical software Statsdirect and MS Excel with an add-in programmed in MS Visual Basic® for Application (VBA).

Recommended literature:
Lepš, J., Šmilauer, P. (2016). Biostatistika. Episteme, Nakladatelství JU, České Budějovice, 438 s. ISBN: 978-80-7394-587-9
Waczulíková, I., Slezák, P. (2015). Introductory Biostatistics. Bratislava: Comenius University, 1st Edition. 147 p. ISBN 978-80-223-3938-4.

Somorčík, J., Teplička, I. (2015). Štatistika zrozumiteľne. Bratislava : Enigma, 1. vydanie, 2015, 244 s. ISBN 9788081330421.
Zvárová J. (2011). Základy statistiky pro biomedicínské obory. Praha : Karolinum. 218 p. ISBN 80-7184-786-0
Motulsky, H. (2014). Intuitive Biostatistics. New York : Oxford University Press, 3rd Edition, 2014, 540 p. ISBN 987-0-19-994664-8.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 64

A	B	C	D	E	FX
64,06	25,0	6,25	4,69	0,0	0,0

Lecturers: prof. RNDr. Iveta Waczulíková, PhD., Mgr. Šimon Šutý, PhD.

Last change: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-214/21	Laboratory Methods in Biomedicine

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

Number of credits: 3

Recommended semester: 4.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: activity during practical exercises
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:
The graduate of the course will gain theoretical and practical experience in the field of basic biomedical analyzes with emphasis on molecular biology and its importance in the clinic. He/she will gain knowledge basics of biological material processing methods and will experience the work in research laboratory.

Class syllabus:
Rules for working in the laboratory of molecular biomedicine, basic instruments; first aid, blood collection, collection of other biological fluids, their basic processing and storage, pressure measurement; blood count, hemocytometer, blood clotting, samples, blood smears; DNA, RNA isolation, their basic analyzes - electrophoresis, PCR, DNase, RNase activity in body fluids; protein determination, western blot, oxidative stress; basics of working with cell cultures, bacteria, yeasts; basics of working with animals intended for animal experiments; microscopy - live cell imager, fluorescence microscopy

Recommended literature:
https://www.fmed.uniba.sk/fileadmin/lf/sluzby/akademicka_kniznica/PDF/Elektronicke_knihy_LF_UK/LABORATORNE_METODY_I.pdf

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 26

A	B	C	D	E	FX
65,38	19,23	11,54	3,85	0,0	0,0

Lecturers: Mgr. Barbora Tamášová, PhD., doc. MUDr. RNDr. Roman Gardlík, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/1-AIN-406/22	Language and Cognition

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

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
Acquisition of the most important current theories and methods of studying natural language and cognitive processes.

Class syllabus:
The course focuses on the most important aspects of natural language research (the most complex cognitive function): basic properties of language (arbitrariness, generative productivity, dynamism, structuring at many levels), mechanisms of speech production and perception, language acquisition, innate and acquired factors of language development.

Recommended literature:
G. Dorren: Babel. Around the World in 20 Languages. Profile Books, 2019
S. Pinker: Language Instinct. ſBrilliance Audio, 2014
S. Pinker: The Stuff of Thought. Language as a Window Into Human Nature. Penguin Books 2008
S. Pinker: Words and Rules. The lngredients of Language. Basic Books 2015

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 172

A	B	C	D	E	FX
37,21	23,84	15,12	11,05	5,23	7,56

Lecturers: doc. PhDr. Ján Rybár, PhD.

Last change: 17.05.2024
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-OZE-271/10	Laser Technique

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

Number of credits: 3

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: presentations on a selected topic
Final exam: oral / written written semestral project
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Acquisition of basic principles of construction of optical quantum generators and amplifiers.

Class syllabus:
Optical resonators, their mirrors and dispersion elements of resonators. Methods of forming laser radiation. Specifics of gas, solid state and semiconductor lasers. Laser pulse shortening methods. Use of lasers in science, industry and medicine.

Recommended literature:
Wilson J., Hawkes J. F. B., Lasers principles and applications, Prentice-hall, N. Jersey 1987
P. Engst, Horák M., Aplikace laserů, SNTL, Praha 1989
available scientific literature

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
79,31	10,34	6,9	3,45	0,0	0,0

Lecturers: RNDr. Pavel Vojtek, CSc.

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚCJ/1-BMF-130/22	Latin Medical Terminology

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: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
100% attendance in seminars and passing 2 written tests, while the overall evaluation is determined from the average of the obtained evaluations as follows: the midterm test has a value of 15% of the total evaluation and the final test has a value of 85% of the total evaluation. Evaluation: A (100 – 94 %); B (93 – 87 %); C (86 – 80 %); D (79 – 70%); E (69 – 60 %), Fx (59 – 0 %).
Scale of assessment (preliminary/final): 15/85

Learning outcomes:
Knowledge: Mastering of basic Latin medical terminology with emphasis on technical terms. Mastering of grammar basics that form the basis of medical terminology.
Skills: Understanding the structure of Latin anatomical terms. Correct usage of technical terms.
Students work in the online platforms Moodle (including independent study assignments as well as knowledge-consolidating tasks) and MS Teams (communication with lecturers, sharing additional materials and assignments for independent work). Emphasis is on project teaching and support of independent approach to assignment solving.

Class syllabus:
The significance of international medical terminology. Anatomical nomenclature and clinical terminology (differences). Declension of Latin and Greek nouns with emphasis on anatomical nomenclature. Prepositions. Adjectives of the 1st, 2nd, and 3rd declensions – comparison. Numerals. Grammatical minimum of verb forms. Creation of technical terms – Latin, Greek prefixes and suffixes, compounds, hybrid words. The most common pharmaceutical terms and common formulations.

Recommended literature:
Bujalková, M. – Šimon, F.: Terminologia Medica Latina, Osveta, Martin, 2015, 202 s.
Ivanová, A.: Cursus Latinus Medicinalis (Úvod do štúdia latinskej terminológie), Bratislava UK, 2006, 265 s.
Kábrt, J.: Lexicon Medicum, Praha, 1995.
Kábrt, J., Valach, V.: Stručný lekársky slovník, Vydavateľstvo Osveta, Martin, 1965, 1968, 1999.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 283

A	B	C	D	E	FX
22,26	31,1	18,37	15,55	12,01	0,71

Lecturers: PhDr. Tomáš Hamar, PhD., Mgr. Lucia Lauková, PhD., Mgr. Marek Šibal, PhD., Mgr. Mária Šibalová, PhD., Mgr. Angela Škovierová, PhD., Mgr. Oľga Vaneková, PhD., Mgr. Melinda Vasiľová, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-116/22	Mathematical Methods in Physics (1)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 4 / 1 **per level/semester:** 52 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
For the semester, the student can get 30% (for tests) and the final written exam has a weight of 50%. The student must obtain at least half a point per semester in order to pass the final written exam. Indicative scale: A (100% -91%), B (90% -81%), C (80% -71%), D (70% -61%), E (60% -51%), Fx (50% -0%).
Scale of assessment (preliminary/final): Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students will be able to use advanced mathematical methods necessary to master physics courses. In particular, methods of differential and integral calculus.

Class syllabus:
Scalars and vectors, operations of their use in physics. Linear algebra (solving equations with several variables, linear independence, determinants, matrices). Complex numbers and their use. Limits and derivatives (physical, geometric meaning, rules for calculation, use of derivatives in mathematics and physics - velocity, acceleration, differential, extrema). Integrals (methods of integration - modifications, per partes, substitution). Applications of integrals in physical practice, the principle of superposition (calculation of centers of gravity, moments of inertia, potentials of conservative fields, forces acting between bodies of different shapes). Numerical methods of derivation and integration. Series (Taylor and Mac Laurinov, Fourier series). Differential equations (DE) as a basic language of physics (separable DE, homogeneous DE, DE order reduction method, linear DE of the first and second degree, method of variation of constants, method of indeterminate coefficients, method of compiling DR and their use in physics). DE solutions that cannot be solved explicitly (qualitative method, development into a series, numerical method of LDE solution).

Recommended literature:
Matematika pre fyzikov / A. Grega, D. Kluvanec, E. Rajčan. Bratislava : Slovenské pedagogické nakladateľstvo, 1974
Matematický aparát fyziky / Jozef Kvasnica. Praha : Academia, 1997
Matematické metody ve fyzice a technice / John Warren Dettman ; přeložil Jiří Langer ; vedec. red. Miroslav Brdička. Praha : Academia, 1970

Languages necessary to complete the course:
Slovak, English

Notes:
The subject replaces 1-FYZ-116/22

Past grade distribution
Total number of evaluated students: 262

A	B	C	D	E	FX
18,32	13,36	14,12	17,18	22,9	14,12

Lecturers: doc. RNDr. Radoslav Böhm, PhD., prof. RNDr. Fedor Šimkovic, CSc.

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-117/22	Mathematical Methods in Physics (2)

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 4 / 1 **per level/semester:** 52 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

Course requirements:
For the semester, the student can get 30% (for tests) and the final written exam has a weight of 50%. The student must obtain at least half a point per semester in order to pass the final written exam. Indicative scale: A (100% -91%), B (90% -81%), C (80% -71%), D (70% -61%), E (60% -51%), Fx (50% -0%).
Scale of assessment (preliminary/final): Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students will be able to use advanced mathematical methods necessary to master physics courses. They will be skilled in the use of numerical methods and able to process the measured experimental data.

Class syllabus:
Multiple variable functions. Multidimensional integrals and their use in physics (integration over the "rectangle", integration over the set, substitution method - transformation of the integral into different coordinate systems, calculation of the moment of inertia, calculation of the position of the center of gravity). Vector scalar argument function. Coordinate systems (polar, cylindrical, spherical - volume and area elements, speed determination, accelerations in various bases). Tensors (motivation for the introduction of the tensor - the relationship between the momentum and angular velocity in rotational motion, the moment of inertia tensor and its components, the search for the main axes of the inertia tensor). Curve integrals and their use in physics (curve integrals of the 1st and 2nd kind - work, center of gravity, conservative and non-conservative fields - without criteria). Fundamentals of vector analysis (directional derivation, gradient of scalar function and its Einstein summation convention, Laplace operator in various coordinate systems, rotation and divergence of vector function - creation of "idea" based on analogy with hydrodynamics. Gauss-Ostrogradsky theorem, Stokes theorem and its application Field conservation criteria, area calculation). Fundamentals of statistics (Random variables - discrete and continuous, probability density, Gaussian distribution, calculation of means, standard deviation, applications in physics, data processing elements, arithmetic mean error, data fitting, minimization of the sum of squares). Partial differential equations (DE) and their use in physics (wave equation, methods of solving partial DE). Numerical methods for solving partial DE.

Recommended literature:

Matematické metody ve fyzice a technice / John Warren Dettman ; přeložil Jiří Langer ; vedec. red. Miroslav Brdička. Praha : Academia, 1970
Matematika pre fyzikov / A. Grega, D. Kluvanec, E. Rajčan. Bratislava : Slovenské pedagogické nakladateľstvo, 1974
Matematický aparát fyziky / Jozef Kvasnica. Praha : Academia, 1989
Spracovanie experimentálnych dát / František Kundracik, Jozef Masarik, Štefan Dubnička. Bratislava : Univerzita Komenského, 1999
Základní numerické metody / Milan Vlach. Praha : Státní nakladatelství technické literatury, 1971

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 208

A	B	C	D	E	FX
24,04	15,87	17,79	19,23	16,35	6,73

Lecturers: doc. RNDr. Radoslav Böhm, PhD., prof. RNDr. Fedor Šimkovic, CSc.

Last change: 22.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-113/16	Mechanics

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: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
For the semester, the student can get 30% (for tests) and the final written exam has a weight of 50%. The student must obtain at least half a point per semester in order to pass the final written exam. Indicative scale: A (100% -91%), B (90% -81%), C (80% -71%), D (70% -61%), E (60% -51%), Fx (50% -0%).
Weight of midterm / final assessment: Midterm assessment 30% / 70% final exam.
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Upon completion of the course, students will become familiar with the basic concepts of mechanics such as mass, energy, momentum, angular momentum, moment of inertia, frequency; they will understand the meaning of equations of motion, they will know how to use conservation laws (momentum, mechanical energy, momentum), gain the ability to solve equations of motion for systems consisting of several points or bodies, they will understand the nature of rotational motions and harmonic motions.

Class syllabus:
Physical quantities and units. Movement in one dimension. Vectors. Movement in two and three dimensions. Laws of motion. Applications of Newton's laws of motion. Scalar product, work of constant and non-constant force. Conservative forces and their potential. Energy conservation law. Momentum of the system consisting of several mass points, center of gravity, the law of conservation of momentum. Rotational motion, angular velocity, angular acceleration. Angular momentum of the system consisting of several mass points, the law of its preservation. Inertia tensor. Newton's law for simple rotational motion. Equilibrium conditions. Harmonic oscillator. Damped harmonic oscillator, resonance. Statics and dynamics of fluids (Archimedes' law, Pascal's law, continuity equation, Bernoulli's equation).

Recommended literature:
Fyzika část 1. Mechanika : Vysokoškolská učebnice obecnéfyziky / David Halliday, Robert Resnick, Jearl Walker ; přeložili Jana Musilová ... [et al.]. Brno : Vysoké učení technické VUTIUM, 2000 Fyzika pre študujúcich na vysokých školách technických : 1 : mechanika,

akustika, termika / Dionýz Ilkovič. Bratislava: Alfa, 1972 Všeobecná fyzika : 1 : mechanika a molekulová fyzika / Štefan Veis, Ján Maďar, Viktor Martišovitš. Bratislava : Alfa, 1978.
Electronic texts and presentations on the subject's website

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 861

A	B	C	D	E	FX
21,6	13,24	12,2	10,34	20,91	21,72

Lecturers: doc. RNDr. Radoslav Böhm, PhD., doc. RNDr. Ivan Sýkora, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚLBG/1-BMF-125/00	Medical 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: I., I.II.

Prerequisites:

Course requirements:
Continuous evaluation:
100% participation in practical trainings
Preparation of 2 seminar papers
Test: 2 continuous written tests with 60% pass threshold
Exam: a. written test with 60% pass threshold b. theoretical part - 2 questions (cytology, molecular genetics)
Indicative rating scale: A: 91-100%, B: 81-90%, C: 73-80%, D: 66-72%, E: 60-65%, Fx: 59% and less.
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Learning outcomes:
A student will gain basic information about morphology, physiology, reproduction, genome of prokaryotic and eukaryotic cells, intercellular communication and molecular genetics.
Acquired knowledge:
- morphology, physiology and genome of prokaryotic and eukaryotic cells
- morphology, function and biogenesis of cell organelles - transport of substances into the cell, intercellular spaces and intercellular communication, cellular receptors
- cell reproduction and cell cycle of eukaryotic cells - cell and tissue cultures and their use
- diseases caused by prokaryotic and unicellular organisms, their life cycle and survival strategies
- types of microscopes, their construction and possibilities of use
- basics of the relationship between microorganism and macroorganism
-characterization, classification, genome and reproduction of viruses, mutations and recombination of viruses
- structure, function of nucleic acids, DNA replication, transcription, translation, regulation of proteosynthesis, genetic code, genes of prokaryotic and eukaryotic cells, gene expression, DNA polymorphisms and possibilities of their analysis
- possibilities of DNA transfer and existence of foreign DNA in the cell

- Insertion sequences and transposons, antibiotic resistance (plasmids, vectors, biotechnology, recombination techniques, importance and use of restriction endonucleases, gel electrophoresis)
- extraction and preparation of material for DNA analysis, isolation of nucleic acids
- overview of basic methods used in molecular genetics and possibilities of their use in medical practice, amplification and DNA sequencing
Acquired skills:
- practical use of microscopic technique (light microscope)
- production of native and simple fixed microscopic slides
- culturing eukaryotic cells and tissues in vitro
- morphological diagnosis of selected bacteria and parasitic protozoa
- use of selected methods of molecular genetics
- isolation, incubation, storage of biological material, isolation of DNA from tissue, gel separation of DNA fragments, DNA quantification, cleavage, blotting, denaturation and renaturation of DNA.

Class syllabus:
The cell as a basic building and functional unit of any living organism: morphology, cell surfaces, nucleus, nucleolus, mitochondria, endoplasmic reticulum, ribosomes, Golgi complex, lysosomes, cytoskeleton. Intercellular spaces and intercellular communication. Substance transport - glycocalyx, membrane receptors. Cell cycle: amitosis, mitosis (mitotic apparatus, endomitosis). Cell and tissue cultivations. In vitro cell culture conditions, culture process, regenerative medicine. Viruses: genome, reproduction, mutations and recombination, oncogenic viruses and acutely transforming viruses. Prokaryotic cells - morphology, structure, genome. Parasexual process in bacteria, CRISPR/Cas system. Differences between prokaryotes, eukaryotes and protists: Molecular biology: structure of DNA and RNA, denaturation and renaturation of DNA, DNA replication, transcription, translation, regulation of proteosynthesis and posttranslational modifications, genetic code. Genes of prokaryotic and eukaryotic cells, insertion sequences and transposons, antibiotic resistance (plasmids, recombinant techniques, vectors). DNA analysis and the application of molecular biology in medical practice.

Recommended literature:
Repiská Vanda, Böhmer Daniel, Danišovič Ľuboš, Klimová Daniela: Medical biology and molecular genetics. Bratislava: Comenius University Bratislava, 2020. - 306 p. ISBN 978-80-223-4984-0
Nussbaum, R.L., McInnes, R.R., Willard, H.F.:Thompson & Thompson.Genetics in medicine. 8th edition. Elsevier, Philadelphia. 2016; 546 p.
Alberts, B., et al. Molecular biology of cell. 6th edition. Garland Science, New York. 2015; 1464 p.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 286

A	B	C	D	E	FX
52,8	11,19	15,03	9,79	10,49	0,7

Lecturers: prof. RNDr. Vanda Repiská, PhD., MPH, doc. MUDr. Daniel Böhmer, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-531/22	Medical Devices

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

Number of credits: 3

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: >80% class attendance
Final exam: oral / written written semestral project and oral presentation
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 gain basic information about devices and their use in medical diagnostics, therapy and intensive care medicine, and they will get acquainted with the activities and outputs of the most frequently used devices at clinical and academic institutions.

Class syllabus:
Blood pressure monitors, finger and portable pulse oximeters. Electrocardiograph, electrocardiotocograph, electroencephalograph and evoked potentials, electromyograph. Intensive care unit equipment: medical monitors, external defibrillators and pacemakers, pulmonary ventilators, dialysis unit; implantable devices - stimulators (pacemakers), defibrillators, cardioverters. Imaging systems: X-ray, CT, OCT, digital subtraction angiography, SPECT, PET, MRI, MRA, thermograph, video endoscope, USG (duplex, triplex, Doppler mode, CEUS). Radiotherapy: brachytherapy, hadron therapy, stereotactic surgery. Audiometer, spirometer; Laboratory diagnostics, simulators and didactic tools.

Recommended literature:
D. Shi (Ed.). Biomedical devices and their applications. (2004). Berlin : Springer, 201 p. eBook ISBN 978-3-662-06108-4.
Leoš Navrátil, Jozef Rosina a kol. Medicínská biofyzika. 2., zcela přepracované a doplněné vydání (2019). Praha : Grada, 432 s. ISBN 978-80-271-0209-9.
Jack A. Tuszynski, John M. Dixon. Hoboken, N.J. Biomedical applications of introductory physics. (2002). Wiley 1st edition, 368 p. ISBN: ‍978-0471412953
D.L. Bailey, J.L. Humm A. Todd-Pokropek, A. van Aswegen. Nuclear Medicine Physics A Handbook for Teachers and Students. (2014). The International Atomic Energy Agency, Vienna, Austria. 736 p. ISBN 978–92–0–143810–2.

Simon R. Cherry, James A. Sorenson, Michael E. Phelps. Physics in nuclear medicine. (2003) Philadelphia, Pa. : W. B. Saunders, 544 p. eBook ISBN: 9781455733675.
Zdeněk Seidl a kol. Radiologie pro studium i praxi. (2012). Praha : Grada, 372 s. ISBN 978-80-247-4108-6

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 64

A	B	C	D	E	FX
98,44	1,56	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Martin Kopáni, PhD., prof. RNDr. Iveta Waczulíková, PhD., doc. RNDr. Pavol Vitovič, PhD., Mgr. Šimon Šutý, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.IÚ/1-BMF-330/25	Medical Immunology

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

Number of credits: 3

Recommended semester: 5.

Educational level: I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: none
Final exam: oral / written
Written MCQ test (multiple choice questions) - the student must obtain a min. 70% so that he/she can proceed to the final oral exam (within which the student answers 3 questions).
If remote teaching is necessary, the exam takes place in the form of an online test (min. 70%).
Indicative evaluation scale: A 90 %, B 85 %, C 80 %, D 75 %, E 70 %
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Knowledge: The student acquires general knowledge (regarding tissues, organs, cells, mediators, immune system reactions) and clinical immunology (allergies, autoimmunity, transplantation, hypersensitivity reactions, inflammation, sepsis, immunodeficiency conditions, AIDS, ...). He/she should understand in basic aspects, the role of the immune system in the pathogenesis of various diseases. He/she gets knowledge of the cooperation of the immune system with other systems such as nervous and endocrine system and connection with the psyche (psycho-neuro-endocrine-immune supersystem) – a holistic view.
Cognitive skills: 1. Understanding the role of the immune system in the pathogenesis of various diseases. 2. Ability to recognize conditions of an anaphylactic shock, serum sickness, pseudoallergy that may accompany MRI and CT examinations after administration of gadolinium or radiocontrast agents.

Class syllabus:
Forms of the immune response, an overview of immune mechanisms. Cells of the immune system, primary and secondary lymphoid organs. Antigens. Antibodies; structure and properties. Biological role and clinical significance of antibodies. Monoclonal antibodies.
Complement system. Complement system disorders. Phagocytosis. Disorders of phagocytosis. PAMPs, DAMPs, PRR. Lymphocytes; characteristics, division, biological significance. Membrane antigens. HLA-complex - structure, function, biological and medical significance.
Cytokines, properties and division of cytokines. The role of cytokines in the development and regulation of the immune response and inflammation. Polarization of the immune response.

Overview of hypersensitivity reactions. Allergy. Atopy, anaphylaxis. Anaphylactic shock, anaphylactoid shock, serum sickness. Physiological and pathological autoimmunity. Autoimmune diseases - causes, overview. Basics of serological methods. Laboratory diagnostics of autoimmune diseases.
Immunodeficiencies - primary, secondary. HIV infection / AIDS. Laboratory diagnosis of HIV infection.

Recommended literature:

Buc M. Základná a klinická imunológia pre študentov zubného lekárstva. Bratislava, Univerzita Komenského 2010, ISBN 978-80-223-2312-3.
Buc M., Bucová M. Základná a klinická imunológia pre ošetrovateľstvo a iné nelekárske odbory, 2006, ISBN 80-223-2151-6.
Hořejší Václav a kol. Základy imunologie, 6., aktualizované vydání. Triton, Praha 2017, ISBN 978-80-7553-250-3.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 100

A	B	C	D	E	FX
20,0	22,0	20,0	6,0	24,0	8,0

Lecturers: doc. RNDr. Vladimíra Ďurmanová, PhD., doc. Mgr. Ivana Shawkatová, PhD.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.MÚ/1-BMF-325/25	Medical Microbiology

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

Number of credits: 3

Recommended semester: 5.

Educational level: I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: not applied
Final exam: written and oral
Written test - indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Oral examination: 2 oral questions
The overall evaluation of the exam will be determined as the average of the written and oral examination results.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Basic theoretical knowledge on the properties of medically significant microorganisms (bacteria, viruses, micromycetes, protozoal parasites and parasitic worms) and their interactions with the humans; information on the pathogenicity and virulence of micro-organisms; the origin, spread and development of infectious diseases and ways how to combat microorganisms; an overview of the most important microbial diseases in humans and the basic principles of their microbiological laboratory diagnostics.

Class syllabus:
Microorganisms and humans. Obligatory and opportunistic pathogens. Development and course of microbial diseases. Human microbiota of the skin and mucosal surfaces. Exogenous and endogenous infections. Zoonoses and anthroponoses. Nosocomial infections. Basic characteristics of bacteria (morphology, physiology, genetics, virulence factors, biofilm formation and persistence). Overview of bacterial agents of infectious diseases; the most important groups of medically significant bacteria. Characteristics of viruses, structure of the viral particle. Classification of viruses. Replication of viruses. Viral infection at the level of the cell and the organism. Antiviral drugs. Overview of the medically important DNA and RNA viruses. Prions. Morphology, physiology and virulence factors of mycotical infectious agents. The most important causative agents of human mycoses. Basic properties of parasitic protozoa and parasitic worms. The most important causative agents of human parasitoses. Arthropods as the agents and vectors of infectious diseases. Prevention of infectious diseases spreading. Methods of infectious agents and infectious diseases vectors elimination from the environment of humans. Antimicrobial

drugs. Emergence and spreading of antimicrobial resistance. Active and passive immunization. Immunomodulators of microbial origin. Laboratory diagnostics of microbial diseases.

Recommended literature:
Mikrobiologie pro studenty zdravotnických oborů; 2. doplněné a přepracované vydání / Jiří Schindler. Grada, Praha, 2014

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: 99

A	B	C	D	E	FX
38,38	23,23	16,16	8,08	6,06	8,08

Lecturers: doc. RNDr. Lívia Slobodníková, CSc., Mgr. Hana Dibalová, PhD., RNDr. Martina Dubinová, PhD., Mgr. Marek Straka, PhD.

Last change: 21.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 5.

Educational level: I., I.II., 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: 103					
A	B	C	D	E	FX
46,6	23,3	15,53	7,77	5,83	0,97
Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD.					
Last change: 25.09.2024					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 171

A	B	C	D	E	FX
79,53	18,13	1,17	0,0	0,0	1,17

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 14.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 151

A	B	C	D	E	FX
87,42	9,93	2,65	0,0	0,0	0,0

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 14.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 84					
A	B	C	D	E	FX
41,67	20,24	17,86	13,1	4,76	2,38
Lecturers: doc. Mgr. Pavol Bokes, PhD.					
Last change: 19.10.2016					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.ÚLBG/1-BMF-315/00	Molecular Biology

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: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: 100 % lecture attendance
Final exam: a. test with pass threshold 60 %
b. theoretical part – 2 questions (human genetics)
Indicative evaluation scale: A: 91 - 100 %, B: 81 – 90 %, C: 73 – 80 %, D: 66 – 72 %, E: 60 – 65 %, Fx: 59 % and less
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
A student will gain detailed knowledge about the Human Genome Project, about the genetics of normal and pathological human traits and their diagnostics, about the regulation and deregulation of the cell cycle.
Acquired knowledge:
- organization of the human genome: types of DNA, gene structure, homeoboxes and homeodomains, DNA - histone complex, Human genome project and its significance - chromosome basis of inheritance, chromosome structure, nomenclature, identification techniques
- meiosis, differences between spermiogenesis and oogenesis, abnormalities of cell division
- molecular mechanisms of cell cycle regulation/deregulation and their consequences
- molecular basis of carcinogenesis
- oncogenes, their function in the organism
- mutations of oncogenes, relation to malignancy
- biology of the most common types of tumours: breast, prostate and ovarian cancer, gestational trophoblastic disease, familial cancer
- tumour suppressor genes - their function and nature of mutations
- cell death and apoptosis
- mutagenesis, classification and basic characteristics of mutagens, repair mechanisms - syndromes of increased spontaneous chromosomal instability
- gene therapy
- malignancies associated with a typical chromosomal rearrangement

- basic methods of human genetics (gemelological method, genealogical method, population genetics) - monogenic diseases (autosomal dominant, codominant and recessive inheritance, X-chromosome-linked inheritance)
- multifactorial inheritance of quantitative and qualitative features - normal variability - pathological conditions with multifactorial type of heredity, congenital malformations, diseases of civilization, theory of threshold effect, predisposition to the so-called diseases of civilization, possibilities of prenatal diagnostics
- traditional cytogenetics (in interphase and mitosis) and molecular cytogenetics
- chromosome aberrations in humans (numerical, structural), mechanism of their origin, frequencies and types of the most common chromosomal aberrations, risk of their recurrence, aberrations of sex chromosomes X and Y and the effect of gene dose, mosaicism the incidence of congenital malformations in the population of miscarriages, and neonates, prenatal genetic diagnosis and prognosis
- molecular basis of embryogenesis, role of apoptosis
- Introduction to developmental genetics
- teratogenesis, basic characteristics, mechanism of development, possibilities of differential diagnostics

Class syllabus:

Chromosomal basis of inheritance: chromosome structure, nomenclature, identification techniques. Meiosis. Differences between spermiogenesis and oogenesis. Classification of genetic diseases: monogenic diseases (autosomal dominant, codominant and recessive inheritance, X-chromosome-linked inheritance), gene interactions. Chromosomal aberrations, mechanisms of origin, frequency. X and Y sex chromosome aberrations and gene dose effect. Mosaicism. Organization of the human genome: Human genome project - goals, results and ethical issues associated with the project, types of DNA, gene structure, homeoboxes and homeodomains, DNA - histone complex. Cell cycle regulation. Oncogenesis - molecular basis of carcinogenesis - oncogenes, their function in the organism, c-onc, v-onc. Mutations in oncogenes, relation to malignancy. Tumor suppressor genes - their function, and the nature of mutations. Multistep theory, gene dose effect. DNA repair mechanisms. Syndromes of increased spontaneous chromosome fragility. Malignant diseases associated with a typical chromosomal rearrangement. Molecular mechanisms of cell cycle deregulation. Gene therapy. Epigenetics. Apoptosis. Multifactorial and polygenic inheritance. Normal variability. Qualitative and quantitative traits, methods of genetic analysis. Pathological conditions with multifactorial type of heredity, congenital malformations, diseases of civilization. Threshold effect theory. Predisposition and possibilities of prenatal diagnostics. Mutagenesis, classification and basic characteristics of mutagens. Mutation frequency. Molecular basis of embryogenesis, role of apoptosis in embryogenesis. Teratogenesis - basic characteristics, mechanism of origin, possibilities of differential diagnostics. Occurrence of congenital malformations in the population of miscarriages and in newborns. Prenatal genetic diagnosis and prognosis.

Recommended literature:

Repiská Vanda, Böhmer Daniel, Danišovič Ľuboš, Klimová Daniela: Medical biology and molecular genetics. Bratislava: Comenius University Bratislava, 2020. - 306 p. ISBN 978-80-223-4984-0

Nussbaum, R.L., McInnes, R.R., Willard, H.F.:Thompson & Thompson.Genetics in medicine. 8th edition. Elsevier, Philadelphia. 2016; 546 p.

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 167

A	B	C	D	E	FX
64,07	14,97	11,38	5,39	3,59	0,6

Lecturers: prof. RNDr. Vanda Repiská, PhD., MPH, doc. MUDr. Daniel Böhmer, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 159

A	B	C	D	E	FX
49,69	30,19	12,58	6,92	0,63	0,0

Lecturers: prof. RNDr. Tibor Hianik, DrSc.

Last change: 22.02.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 13

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-132/23	Participation in Empirical Research

Educational activities:
Type of activities: course
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., 6.

Educational level: I., I.II., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

A	B	C	D	E	FX
89,55	1,49	1,49	0,0	2,99	4,48

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-132/23	Participation in Empirical Research

Educational activities:
Type of activities: course
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., 5.

Educational level: I., I.II., II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

A	B	C	D	E	FX
89,55	1,49	1,49	0,0	2,99	4,48

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 143

A	B	C	D	E	FX
65,03	18,88	9,09	2,8	3,5	0,7

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

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 153

A	B	C	D	E	FX
79,74	11,11	1,96	1,96	4,58	0,65

Lecturers: prof. MUDr. Fedor Šimko, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 106

A	B	C	D	E	FX
94,34	3,77	0,94	0,0	0,94	0,0

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I., I.II., 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: 115

A	B	C	D	E	FX
61,74	29,57	4,35	0,0	0,0	4,35

Lecturers: Mgr. Petra Šrámková, PhD., doc. RNDr. Peter Papp, PhD.

Last change: 18.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-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: 0

Recommended semester: 1.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
Orientation in the history of the selected sports discipline, mastering the basic principles of compensation of mostly mental burdens of the individual. Creating a positive, lasting relationship to physical education and sports in the sense of calocagation. Mastering the demands for the development of motor abilities, skills, proper technique of performing individual movements in individual sports, individual game activities in collective sports games.

Class syllabus:
Introduction to the basic history of the selected sport, with the basic principles of compensation of one-sided psychological burden of the individual's body. Development of basic motor skills with a stop to all kinds of endurance, coordination, increasing the level of joint mobility. Training of individual game activities in collective sports games. In individual sports disciplines, practice of basic techniques of individual elements.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 7053

A	B	C	D	E	FX
93,31	1,6	0,21	0,0	0,07	4,81

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

Last change: 16.06.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I.II., 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: 1911

A	B	C	D	E	FX
97,65	0,63	0,05	0,0	0,0	1,67

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, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-120/22	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: 1

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:
Addressing a positive and lasting relationship with physical education and sport by understanding the importance of physical development and maintaining its optimal level throughout life. The use of strength and other motor skills to more rationally manage the game activities of the individual, while improving the acquisition of more complex elements of technology. In everyday life in providing basic necessities.

Class syllabus:
Completing a positive lasting relationship to physical education and sport. Development of motor skills with a focus on the development of strength, with an emphasis on dynamic strength and endurance in strength. In collective sports games, improving individual game activities, practicing basic game combinations, playing with modified rules, tasked games. In individual sports disciplines, the development of motor abilities and skills necessary for the acquisition of more complex elements of lower difficulty techniques.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 5840

A	B	C	D	E	FX
95,6	1,51	0,14	0,09	0,05	2,62

Lecturers: Mgr. Tomáš Kuchár, PhD., PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, PhD., Mgr. Tomáš Lovecký
Last change: 15.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I.II., 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: 1797

A	B	C	D	E	FX
98,44	0,33	0,06	0,06	0,06	1,06

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

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-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: I., I.II.

Prerequisites:

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

Learning outcomes:

Class syllabus:
To practise game combinations, tactical - mechanical elements in basketball, volleyball, soccer, floorball, ice hockey, badminton, competition rules in the sports specialization.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3268

A	B	C	D	E	FX
98,29	0,46	0,09	0,03	0,0	1,13

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

Last change: 16.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 9.

Educational level: I.II., 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: 1454

A	B	C	D	E	FX
98,56	0,41	0,07	0,0	0,07	0,89

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, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-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: I., I.II.

Prerequisites:

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

Learning outcomes:

Class syllabus:
Preparation for sport championships of the Faculty in the chosen sport at modified rules. The selection of talented students into the teams of the University and Faculty leagues and other faculty sport events.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2956

A	B	C	D	E	FX
97,94	0,17	0,1	0,03	0,0	1,76

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

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 10.

Educational level: I.II., 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: 1267

A	B	C	D	E	FX
98,34	0,39	0,08	0,08	0,08	1,03

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

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-310/00	Physical Education and Sport (5)

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: 5.

Educational level: I., I.II.

Prerequisites:

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

Learning outcomes:

Class syllabus:
Preparation and participation of individuals and teams in the system of university sport competitions and sport events.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2172

A	B	C	D	E	FX
98,66	0,37	0,09	0,0	0,0	0,87

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

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-320/22	Physical Education and Sport (6)

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: 1

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Antirequisites: FMFI.KTV/1-MXX-320/00

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

Learning outcomes:

Class syllabus:
Using the communication in the physical education and sport and organizing the sport championships to achieve expressive motion of the sport and health in a valuable orientation the students.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 204

A	B	C	D	E	FX
94,61	0,49	0,49	0,0	0,0	4,41

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, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-168/22	Physical Mechanisms of Processes in the Human Organism

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: I., I.II.

Prerequisites:

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

Learning outcomes:
Explanation of basic physical mechanisms of various processes in the human body.

Class syllabus:
Effects of mechanical energy on processes in the human body. Influence of gravity, over-pressure, under-pressure, shocks and vibrations. Audio signal reception. Effect of sound and ultrasonic fields. Perception of ultrasound and infrasound by a living organism. Thermoregulatory mechanisms in the body. Influence of heat, cold and humidity on thermoregulation. Perception of mechanical stimuli and pain by the nervous system. Mechanisms of olfactory and taste perception. Mechanisms of memory and learning. Sight physics. Viewing angle and stereoscopic parallax. Vision theory. Respiratory gas exchange, breathing model. Electrical irritation of tissues and conduction of electric current through tissues. Analysis of the effects of magnetic fields on processes in the human body.

Recommended literature:
Biophysics: a physiological approach / Patrick F. Dillon. Cambridge: Cambridge University Press, 2012
Methods in modern biophysics / Bengt Nölting. Berlin: Springer, 2006

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 17

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: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.FyÚ/1-BMF-260/00	Physiology (1)

Educational activities:
Type of activities: lecture / laboratory 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: 4.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: to complete written assignments in practicals / 4 chapter credit tests
Final exam: oral in 3/Z
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Knowledge: To obtain the knowledge of facts and to understand their relationships in the topic of blood physiology, physiology of the excitable tissues, physiology of respiration, physiology of digestive system, nutrition and metabolism. To gain basic knowledge about diseases prevention and healthy lifestyle.
Skills: To acquire skills in recording and evaluation/interpretation of results of selected blood examinations, examinations of the respiratory system, nutritional status and metabolism. To gain basic laboratory skills (use of microscope, pipette), be skilled in basic medical examinations and measurements (determination of hematocrit, blood groups, haemoglobin concentration, count of blood elements, leukogram, nutritional status, metabolic rate, basic spirometry).

Class syllabus:
Blood - blood plasma, blood elements, acid-base balance, osmotic pressure, blood groups, blood clotting and haemostasis, erythropoiesis.
Excitable tissues - receptors, resting membrane potential, action potential, synapses, functional properties of nerve, skeletal and smooth muscle.
Respiration - functions of respiratory system, ventilation and exchange of respiratory gases, lung volumes and capacities, transport of O2 and CO2, breathing and regulation of the blood pH, influence of changes in atmospheric pressure, regulation of breathing.
Digestive system and nutrition - mastication, swallowing, motility of stomach, small and large intestine, functions of digestive juices and their secretion, digestion and absorption of nutrients, function of liver. Basics of nutrition and principles of balanced diet.
Metabolism - energy intake and expenditure, basal and total metabolic rate, energy value of nutrients, energy equivalent and respiratory quotient, oxygen debt, metabolism of carbohydrates, fats, proteins and its regulation.

Recommended literature:

Ostatníková, D. a kol. Základy lekárskej fyziológie. 3. vyd. Bratislava: Univerzita Komenského v Bratislave, 2019. 290 s. ISBN 978-80-223-4744-0.
Javorka, K. a kol. Lekárska fyziológia: učebnica pre lekárske fakulty. 5. preprac. a dopl. vyd. Martin: Osveta, 2021. 769 s. ISBN 978-80-8063-496-4.
Ostatníková, D. a kol. Fyziologické praktikum. Bratislava: Univerzita Komenského, 2021. 236 s. ISBN 978-80-223-5171-3.

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: 198

A	B	C	D	E	FX
41,41	26,26	24,75	5,05	0,51	2,02

Lecturers: prof. MUDr. Katarína Babinská, PhD., MUDr. Rastislav Važan, PhD., MUDr. Mária Vidošovičová, MUDr. Mgr. Rudolf Drábek

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF.FyÚ/1-BMF-320/00	Physiology (2)

Educational activities:
Type of activities: lecture / laboratory 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: 5.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: to complete written assignments in practicals / presentation of seminar work / 4 chapter credit tests
Final exam: oral in 3/Z (2 questions)
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Knowledge: To obtain the knowledge of facts and to understand their relationships in the topic of the cardiovascular physiology, thermoregulation, excretory system, endocrine system and reproduction, senses and central nervous system. To gain basic knowledge about diseases prevention and healthy lifestyle.
Skills: To acquire skills in recording and evaluation/interpretation of results of selected examinations of the cardiovascular system, sensory organs and central nervous system; to gain skills in basic medical examinations and measurements (examination of the arterial pulse, blood pressure, ECG, visual acuity, eyeground, visual field, otoscopy and audiometry, examination of basic reflexes); to get skills in presentation of scientific information and information about diseases prevention and healthy lifestyle in form of short lecture and discussion.

Class syllabus:
Cardiovascular system - physiological properties of the cardiac muscle, cardiac cycle, heart sounds, arterial pulse, electrocardiography, blood flow in vessels, blood pressure, transcapillary exchange, lymph circulation, organ blood circulations.
Thermoregulation - body temperature and its biorhythms, heat production and losses, mechanisms of thermoregulation.
Kidneys - body fluids and their ion-structure, glomerular filtration and tubular processes, acid-base balance, formation of urine, regulation of renal functions.
Endocrine system and reproduction - mechanisms of hormonal action, hierarchy in endocrine system, functions of the hypothalamus - pituitary system, functions of other hormones of endocrine glands.

Senses - classification and function, vision, hearing, taste, olfaction, sense of balance, mechanoception, thermoreception, nociception, proprioception.
Central nervous system - reflex, reflex arch, sensation and perception, regulation of movements and muscle tone, higher nervous functions - memory, emotions, learning, speech.

Recommended literature:

Ostatníková, D. et al. Basics of Medical Physiology. Bratislava: Comenius University, 2021. 298 p. ISBN 978-80-223-5129-4
Ostatníková, D. et al. Laboratory Guide to Medical Physiology. Bratislava: Comenius University, 2018. 210 p. ISBN 978-80-223-4499-9
Silverthorn, D.U. Human Physiology: An Integrated Approach. 8th ed. University of Texas Austin: Pearson, 2019. Global Edition. 975 p. ISBN 978- 01-346-0519-7
Koeppen, B.M. and Stanton, B.A., eds. Berne & Levy Physiology: With Student Consult Online Access. 7th ed. Philadelphia: Elsevier, 2017. 880 p. ISBN 978-03-233-9394-2

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: 180

A	B	C	D	E	FX
22,78	16,67	21,11	13,89	17,78	7,78

Lecturers: prof. MUDr. Katarína Babinská, PhD., MUDr. Rastislav Važan, PhD., MUDr. Mária Vidošovičová, MUDr. Mgr. Rudolf Drábek

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-OZE-372/10	Practical Training in Radiometry and Spectrometry

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: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: elaboration of laboratory protocols.
Final evaluation: 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:
Upon completion of the course, students will gain practical experience in the use of spectrometric and radiometric methods.

Class syllabus:
Study of the basic characteristics of the semiconductor spectrometer. Study of the analysis of a complex gamma spectra. Investigation of the properties of a large area gas counter. Determination of the integral alpha and beta activity of solid samples. Measurement of radon activity concentration by scintillation chamber. Determination of detection efficiency in quenched samples in liquid scintillation technique. Analysis of air samples by semiconductor alpha spectrometer. Determination of radionuclide activity based on dose rate.

Recommended literature:
Gamma and X-Ray spectrometry with semiconductor detectors / Klaus Debertin, Richard G. Helmer. Amsterdam : Elsevier, 1988
Státní úřad pro jadernou bezpečnost: Stanovení radonového indexu pozemku přímým měřením, SÚJB, 2012

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 5

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

Lecturers: doc. RNDr. Ivan Sýkora, PhD., doc. RNDr. Monika Müllerová, PhD., Mgr. Ivan Kontuľ, PhD., RNDr. Terézia Eckertová, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-BMF-211/22	Practical in Mechanics and Molecular Physics

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: 3

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: preparation for the practice, writing of reports from individual tasks
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Improvement and use of theoretical knowledge of mechanics and molecular physics, mastering basic physical measurement methods. The student will master the basic habits of independent scientific work in physics research: working with literature, laboratory protocol, obtaining experimental erudition, critical evaluation of measurement and physical interpretation of processed results, written processing of individual physical problems in the form of a paper.

Class syllabus:
In practice, students will gain skills in experimental verification of basic physics laws (Gravitational Law, Hooke's Law, Ideal Gas Law,…), quantitative investigation of physical events (state changes, oscillations, polytropic process,…) and measurement of some basic physical quantities (modulus of elasticity, density, viscosity, speed of sound, humidity, surface tension, gravitational constant, gravitational acceleration,…). Tasks: Density measurement. Measurement of modulus of elasticity. Vibrations of coupled pendulums. Measurement of gravity acceleration. Moment of inertia measurement. Gravitational constant measurement. Heat capacity measurement. Evaporation heat measurement. Determination of dynamic viscosity of fluids. Measurement of dynamic viscosity of liquids by commercial viscometers. The fall of a sphere in a confined gaseous environment. Polytropic process. Determination of surface tension of liquids. Measurement of relative and absolute humidity. Measuring the speed of sound in air. Basic properties of oscillating motion. Some tasks are equipped with sensors allowing measurement and processing of data by computers. For some tasks, conventional measuring instruments and aids are used.

Recommended literature:
Praktikum z mechaniky a molekulovej fyziky / Nadežda Zrubáková, Elena Brežná, Božena Pisoňová. Bratislava : Univerzita Komenského, 2003

Praktikum z mechaniky a molekulovej fyziky / Nadežda Zrubáková, Elena Brežná, Božena Pisoňová. Bratislava : Univerzita Komenského, 1999

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 82

A	B	C	D	E	FX
87,8	9,76	2,44	0,0	0,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc., RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-FYZ-322/22	Practical in atomic and nuclear physics

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

Number of credits: 3

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Recommended prerequisites:
1-FYZ-231/22 Introduction to Modern Physics (Physics 2/S)

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

Learning outcomes:
Gain experimental skills with used instrumentation, registration of ionizing radiation and processing of measured data. In the realized experiments, make sure of the agreement of experiments and theories that clarify them.

Class syllabus:
In the introductory exercise, students will get acquainted with the methods used to process electrical pulses from ionizing radiation detectors (differential discriminator, single-channel and multi-channel analyzer). Separate laboratory exercises follow
- from atomic physics: Franck-Hertz experiment (verification of Bohr's postulates), Stefan-Boltzmann's law (radiation of an absolutely black body), range of alpha particles in air (principles of semiconductor detectors)
- from nuclear physics: statistical nature of nuclear transformations, determination of gamma radiation energy (principles of scintillation detectors), verification of Compton scattering
- from applied nuclear physics: measurement of air radioactivity (principles of Geiger-Müller detectors).

Recommended literature:
- instructions for exercises at http://www.dnp.fmph.uniba.sk/~kollar/navodnik.htm
- Physics practicum IV: Atomic physics and ionizing radiation detection / Matej Florek ... [et al.]. Bratislava: Comenius University, 1988

Languages necessary to complete the course:
Slovak, English.

Notes:
Recommended range of instruction (in hours): 39
Weekly: 2P + 1H Period of study: 27 P (9 weeks x3h) +12 H (4 weeks x3h)

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
83,78	10,81	0,0	0,0	5,41	0,0

Lecturers: doc. RNDr. Monika Müllerová, PhD., doc. RNDr. Miroslav Ješkovský, PhD., RNDr. Miroslav Pikna, PhD.

Last change: 24.02.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-FYZ-222/22	Practical in electricity and magnetism

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

Number of credits: 3

Recommended semester: 4.

Educational level: I., I.II.

Prerequisites: FMFI.KEF/1-FYZ-217/22 - Electromagnetism or FMFI.KEF/1-TEF-204/22 - Electricity and Magnetism

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

Learning outcomes:
Acquisition of skills in registration and data processing by computer, measurement of electrical and magnetic quantities. Physical interpretation and written / graphic presentation of processed results.

Class syllabus:
In the initial two or three exercises, joint acquisition of skills and measurement with analog and digital devices (oscilloscope, digital multimeter, A / D converter), processing of measured data by computer. This is followed by five to six separate laboratory works on electricity and magnetism selected from the offer: electrical properties of substances - electric bridges, Hall effect; electric field mapping; magnetic field mapping - air coils; electromagnetic induction - transformer; electrical RLC oscillations - transient RLC phenomenon, serial and parallel RLC circuit; magnetic properties of substances - hysteresis loops, permeability of substances, separation of magnetic losses; fuel cell; determination of the specific charge of an electron (e / m0).

Recommended literature:
- e-learning systém k predmetu s aktualizovanými podkladmi k experimentom
- Fyzikálne praktikum II : Návody na praktické cvičenia z elektriny a magnetizmu / Ján Pavlík. Bratislava : Univerzita Komenského, 2002
- Elektromagnetizmus, Andrej Tirpák, Bratislava: Polygrafia SAV, 1999

Languages necessary to complete the course:
Slovak, English (designations of instrument controls and their manuals)

Notes:
Recommended range of instruction (in hours): 39
Weekly: 2P + 1H Period of study: 27 P (9 weeks x3h) +12 H (4 weeks x3h)

Past grade distribution
Total number of evaluated students: 85

A	B	C	D	E	FX
61,18	25,88	3,53	2,35	2,35	4,71

Lecturers: doc. RNDr. Tomáš Roch, Dr. techn., Mgr. Branislav Grančič, PhD., Ing. Pavol Ďurina, PhD., doc. RNDr. Juraj Országh, PhD., Mgr. Leonid Satrapinskyy, PhD., Mgr. Ľubomír Staňo, PhD., Mgr. Veronika Hidaši Turiničová, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-FYZ-321/22	Practical in optics

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

Number of credits: 3

Recommended semester: 3.

Educational level: I., I.II.

Prerequisites:

Recommended prerequisites:
1-FYZ-218/22 Optics (Physics 2/S), or 1-UFY-210/00 Waves and Optics (Physics Teacher Training in combination 2/S), or 1-TEF-205 Optics (Technical Physics 2/S)
or 1-FYZ-211/17 Electromagnetism and Optics (Physics 2/W)

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

Learning outcomes:
Physical interpretation and written / graphic presentation of processed results.

Class syllabus:
Through a series of measurements, we get acquainted with basic concepts and phenomena such as: light sources - radiation - reflectivity - absorption - photometry - basic photometric quantities. Next, we examine phenomena such as - light interference (two-beam interference, multi-beam interference), diffraction, light dispersion, refractive index, light polarization, optical activity. From the lecture we will repeat the basics of optical imaging - geometric optics and explain the construction of selected optical instruments, such as: photometer, microscope, telescope, monochromator, spectrometer, refractometer, interferometer, etc.) Some will be constructed and their parameters verified. We will measure some basic physical constants.
Each mathematical formulation of the investigated physical dependence (phenomenon) can be transformed into a certain measurable dependence (dependent on the so-called parameters). These are usually of various importance in terms of the phenomenon under study. In addition to storing the measured data, it is appropriate to display the measured data continuously graphically, which allows, especially when compared with the expected functional dependence, better visual inspection and more prompt detection and possible elimination of found errors.
There is a computer for each task. It includes instructions for the task, a program for evaluating measurements and graphical display of measured data and a program for a virtual experiment in

the case of distance learning or. the need to carry out a parallel experiment to better understand the phenomenon. The measured tasks and their selection can be adapted to the respective field of study.

Recommended literature:
- Web = instructions for the subject with updated data for experiments
- Pavel Vojtek: Practical exercises in optics, MFF UK, 1992, scripts
- Štrba A., Mesároš V., Senderáková D .: Optics with Examples, MFF UK, 1996, scripts

Languages necessary to complete the course:
Slovak, English (designations of instrument controls and their manuals)

Notes:
Recommended range of instruction (in hours): 39
Weekly: 2P + 1H Period of study: 27 P (9 weeks x3h) +12 H (4 weeks x3h)

Past grade distribution
Total number of evaluated students: 35

A	B	C	D	E	FX
71,43	25,71	2,86	0,0	0,0	0,0

Lecturers: RNDr. Ján Greguš, PhD., Mgr. Michaela Horňáčková, PhD., RNDr. Pavel Vojtek, CSc., RNDr. Zuzana Zábudlá, Mgr. Branislav Grančič, PhD.

Last change: 22.02.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF/1-BMF-316/22	Principles of Medical Education (1)

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

Number of credits: 2

Recommended semester: 5.

Educational level: I., I.II.

Prerequisites:

Course requirements:
100% active participation in lectures
Final exam:
- Practical part - writing an essay on a given topic
- theoretical part - oral exam
Test evaluation: A: 91 - 100 %, B: 81 – 90 %, C: 73 – 80 %, D: 66 – 72 %, E: 60 – 65 %, Fx: 59 % - 0%.
The overall rating is determined from the average of the ratings obtained.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Knowledge: Knowledge: After completing the subject, the student acquires knowledge about the specifics of adult education with a focus on Medical Education in an active way of learning during the lessons. Students will learn deeper using critical thinking, and clinical reasoning using clinical cases and learn with use of reflection and personal feedback. Students will be familiar with basic principles of using Simulations in medical Education, especially High-Fidelity simulators, standardized patients and use of e-learning and virtual patients. They will be familiar with current forms of Medical Education, as well as with new methods in MedEd, active learning (eg Team-based learning, problem-based learning, peer-to-peer, near-peer learning) and their effective use during the classes. Students gain knowledge about the specifics of the bedside teaching, structured consultation models, and communication skills needed. They are also will be familiar with basics of Medical Education Research.
Skills:
The student will acquire the skills in a hands-on way to use effective strategies needed to educate students at medical faculties as an educator in preclinical as well as clinical education after graduation and prepare for the role of a physician-educator for the students as well for future patients. They will participate in a project focused on Medical Education Research.

Class syllabus:
1. Adult learning, role of motivation in teaching and learning, integration of medical disciplines in clinical case teaching

2. New methods of teaching and learning (hands-on)
3. Clinical reasoning in Medical Education, the role of reflection and feedback in learning. 4. Simulation teaching – High-fidelity simulators in teaching
5. Active forms of education in medicine (active lectures, group-based learning, team-based learning, project-based learning, problem-based learning, case-based learning)
6. Bedside teaching, structured consultation models, and communication skills
7. Peer-to-peer, near-peer teaching, teaching in groups
8. Assessment in medical education, standardized patients, OSCEs (Objective Structured Clinical Exam)
9. Research in Medical Education, Inovative Curriculum development, Integrated curriculum
10. Project in Medical Education

Recommended literature:

Dent JA, Harden RM. A Practical Guide for Medical Teachers. 6th ed. Churchill Livingstone Elsevier, 2021. 496 s.
Harden RM, Laidlaw JM. Essential Skills for a medical teacher. An introduction to teaching and learning medicine. Churchill Livingstone Elsevier. 2020. 334 s.
AMEE and BEME Educational Guides

Languages necessary to complete the course:
Slovak, English

Notes:
the course has a limited capacity of 12 students, in case of higher interest 12 enrolled students will be selected according to previous activities in the field

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: MUDr. Silvia Hnilicová, PhD., prof. MUDr. Daniela Ostatníková, PhD., prof. RNDr. Iveta Waczulíková, PhD., RNDr. Marcela Morvová, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI-LF/1-BMF-317/22	Principles of Medical Education (2)

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

Number of credits: 2

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
- 100% active participation in lectures
Final exam:
- Practical part - writing an essay on a given topic
- theoretical part - oral exam
Test evaluation: A: 91 - 100 %, B: 81 – 90 %, C: 73 – 80 %, D: 66 – 72 %, E: 60 – 65 %, Fx: 59 % - 0%.
The overall rating is determined from the average of the ratings obtained.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Knowledge, skills, attitudes:
Clinical reasoning concepts Demonstrate an understanding of Clinical reasoning theories (e.g. script, dual process), How clinical reasoning ability develops, The role of clinical reasoning in safe and effective care for patients, Cognitive errors, Other factors that may impair the clinical reasoning process/outcome
History and physical examination Demonstrate the ability to use: Effective communication skills and purposeful interviewing, History taking from all available sources when relevant, Hypothesis-driven enquiry, Knowledge of epidemiology, probability of the presence of signs and symptoms in specific diseases, and likelihood ratios to estimate clinical probability
Choosing and interpreting diagnostic tests Demonstrate a practical understanding of and ability to use the following: Pre-test (clinical) probability and post-test probability. Sensitivity and specificity, Predictive values, Factors other than disease that influence test results, Important characteristics of commonly used tests relevant to local context, Evidence-based guidelines
Problem identification and management Demonstrate an ability to produce: An accurate problem representation or problem list, Use of semantic qualifiers and precise medical terms, Prioritised differential diagnosis, including relevant ‘must not miss’ diagnoses, Safe actions when a diagnosis is not possible, Management plans taking patient’s preferences, co-morbidities, resources, cost-effectiveness and local policies in to account, Metacognition and critical thinking in decision making

Shared decision making Demonstrate the ability to make decisions with: Patients and carers, Clinical teams, Guidelines, scores and decision aids, Evidence-based medicine applied to the patient's circumstances, Professional values and behaviours that support decision making
Medical Ethical Reasoning: Ethical knowledge is composed of knowledge of ethical principles, ethical theory, professional codes and legal regulations. Cognitive reasoning skill is composed of problem identification and information gathering, decision making, planning and action. The domain of attitudes refers to the values or beliefs governing the justification. The justification is related to logic-based decision which can be concluded by considering the different perspectives of all the parties involved, minimizing potential conflicts among stakeholders and between competing principles and evaluating consequences.

Class syllabus:

Clinical reasoning concepts, Clinical reasoning theories (e.g. script, dual process), The role of clinical reasoning in safe and effective care for patients, Cognitive errors, Other factors that may impair the clinical reasoning process/outcome
Specifics of History taking and physical examination: Effective communication skills and purposeful interviewing, History taking from all available sources, Hypothesis-driven enquiry, Knowledge of epidemiology, probability of the presence of signs and symptoms in specific diseases, and likelihood ratios to estimate clinical probability
Specifics of choosing and interpreting diagnostic tests: Pre-test (clinical) probability and post-test probability. Sensitivity and specificity, Predictive values, Factors other than disease that influence test results, Important characteristics of commonly used tests relevant to local context, Evidence-based guidelines
Problem identification and management: An accurate problem representation or problem list, Use of semantic qualifiers and precise medical terms, Prioritized differential diagnosis, including relevant 'must not miss' diagnoses, Safe actions when a diagnosis is not possible, Management plans taking patient's preferences, co-morbidities, resources, cost-effectiveness and local policies, Metacognition and critical thinking in decision making
Shared decision making with patients and caregivers, Clinical teams, Guidelines, scores and decision aids, Evidence-based medicine applied to the patient's circumstances, Professional values and behaviors that support decision making, Strategies that build understanding, strategies that employ structured , clinical cases and corrective feedback, strategies that structure knowledge around problem-specific concepts, strategies that employ retrieval, strategies that differ according to stage of learning
Medical Ethical Reasoning: Ethical knowledge is composed of knowledge of ethical principles, ethical theory, professional codes and legal regulations. Cognitive reasoning skill is composed of problem identification and information gathering, decision making, planning and action. The domain of attitudes refers to the values or beliefs governing the justification. The justification is related to logic-based decision which can be concluded by considering the different perspectives of all the parties involved, minimizing potential conflicts among stakeholders and between competing principles and evaluating consequences.
Clinical Ethical Reasoning and its contribution to medical education: Ethical knowledge is composed of knowledge of ethical principles, ethical theory, professional codes and legal regulations. Cognitive reasoning skill is composed of problem identification and information gathering, decision making, planning and action. The domain of attitudes refers to the values or beliefs governing the justification.

Recommended literature:

Hanáček, Mokrý: Trendy v medicínskom vzdelávaní a hodnotenie jeho výsledkov, Osveta, 2018, 255 s.

Kassirer, Wong, Kopelman: Learning clinical reasoning, 2010, ISBN‍9780781795159
Irfan: The Hands-on Guide to Clinical Reasoning in Medicine, 2019, ISBN 9781119244035
Frain, Cooper: ABC of Clinical Reasoning, 2016, ISBN‍9781119059080
Jonsen, A.R., Siegler, M., Winslade, W.J. Klinická etika. Praktický přístup k etickým rozhodnutím v klinické medicíně. 1. vyd. Praha: Stanislav Juhaňák - Triton 2019. 232 s.

Languages necessary to complete the course:
Slovak, English

Notes:
The course has a limited capacity of 12 students, in case of higher interest 12 enrolled students will be selected according to previous activities in the field.

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: MUDr. Silvia Hnilicová, PhD., prof. MUDr. Daniela Ostatníková, PhD., prof. RNDr. Iveta Waczulíková, PhD.

Last change: 11.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KDMFI/1-AIN-130/22	Programming (1)

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

Number of credits: 9

Recommended semester: 1.

Educational level: I., I.II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-130/13

Course requirements:
Continuing evaluation: homework assignments (30%)
Exam: midterm (20%) , written exam (50%)
To successfully complete the course, student has to obtain at least 50% of points
Final grade: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will gain basic programming skills in the Python object-oriented programming language, become familiar with the basic data structures of the language, and gain their first skills with object-oriented programming.

Class syllabus:
Python programming language development environment;
programs, functions, recursion, modules;
data structures, lists, strings, files, dictionaries, sets;
graphical applications, events;
object-oriented programming, inheritance, polymorphism.

Recommended literature:
Summerfield: Programming in Python 3, Addison-Wesley Professional 2009
Miller: How to Think Like a Computer Scientist: Interactive Edition, web: http://interactivepython.org/runestone/static/thinkcspy/index.html

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 1186

A	B	C	D	E	FX
29,26	11,47	10,46	7,42	12,06	29,34

Lecturers: RNDr. Andrej Blaho, PhD., PaedDr. Andrea Hrušecká, PhD., PaedDr. Daniela Bezáková, PhD.

Last change: 26.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/1-PMA-751/13	Programming in R

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

Number of credits: 2

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Evaluation based on: two tests (test1 40%, test 2 60%, teaching period)
Approximate grade thresholds: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will learn to work in the R environment, program simple functions and work with data frames.

Class syllabus:
Working with envoronment and R workspaces, basic operations.
Manipulating variables, vectors, matrices and data frames.
Conditional statements and flow control. Basic programming techniques, writing scripts and functions. Working with data files, elementary statistical operations. Using graphical procedures for data visualization. Basic optimization functions. Creating documents with R markdown.

Recommended literature:
Matloff N: The art of R programming : A tour of statistical software design, San Francisco, No Starch Press (2011); Filová L: Programovanie v jazyku R, study materials (2021)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 290

A	B	C	D	E	FX
49,31	14,14	9,66	12,07	9,66	5,17

Lecturers: Mgr. Radoslav Hurtiš, PhD., doc. Mgr. Lenka Filová, PhD.

Last change: 24.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 10.

Educational level: I.II., 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: 77

A	B	C	D	E	FX
98,7	0,0	0,0	0,0	0,0	1,3

Lecturers: prof. RNDr. Libuša Šikurová, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-310/22	Quantum Mechanics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 2 **per level/semester:** 39 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 5.

Educational level: I., I.II.

Prerequisites:

Recommended prerequisites:
-

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

Learning outcomes:
Creative acquaintance of students with the basic principles and applications of quantum mechanics, with special regard to the application of quantum mechanics to bio-molecular systems

Class syllabus:
1. Experimental starting points of quantum theory. 2. Phoelectric effect and black body radiation. 3. Introduction of wave mechanics. 4. Schrodinger equation and properties of its solutions. 5. Applications on hydrogen atom and other simple exactly solvable systems. 6. Angular momentum and spin. 8. Approximative methods of quantum mechanics. 9. Perturbation and variational methods. 10. Quantum tunneling and possible aplications of quantum mechanics in chemistry and biology. 11. Epistomological questions of quantum mechanics. 12. Relativistic quantum theory.

Recommended literature:
L. Schiff.: Quantum Mechanics, McGraw Hill, 1985.
A. Davydov, Quantum Mechanics in Biology, Kluwer, 1990.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 182					
A	B	C	D	E	FX
52,2	28,02	13,74	3,3	1,1	1,65
Lecturers: prof. RNDr. Peter Babinec, CSc., Mgr. Ivan Sukuba, PhD.					
Last change: 09.03.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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., Mgr. Ivan Sukuba, PhD.

Last change: 14.03.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 95

A	B	C	D	E	FX
98,95	1,05	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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-OZE-244/15	Radiometric Measurements

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: I., I.II.

Prerequisites:

Course requirements:
Exam: written and oral exam, successful completion of the written part is condition of the oral part.
Share in the overall rating: 80/20.
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 gain a basic theoretical understanding of the characteristics of various detectors and the possibilities of their use for measuring various types of radiation and dosimetric quantities.

Class syllabus:
Allocation of dosimetric methods, allocation of radiometry in protection against ionizing radiation. Basic structure of measuring apparatus. Specifics of radiometric measurements. Block diagram of measuring apparatus. Basic characteristics of detectors. Response function. Time characteristics. Energy resolution. Nuclear radiation detection methods. Principles of detection. Gas, semiconductor and scintillation detectors. Methods for measuring volume activity. Criteria for method selection, sampling, adjustment, optimization of measurement conditions. Concept of low activity, coefficient of quality, detection limits. Background, an overview of methods of reducing it. Analysis of samples containing alpha emitters. Sample thickness problems. Ionization chamber and grid. Determination of beta-emitter activity. "Total beta-activity", selective determination of nuclides, problems of low-energy radiation, internal computers (proportional and scintillation). Determination of detection efficiency for quenching samples. Methods for determining tritium, radiocarbon. Use of Cherenkov radiation for activity measurement. Gamma spectrometry of environmental samples. Scintillation and semiconductor spectrometry methods, energy dependence of detection efficiency, instrument spectrum processing, energy resolution. Spectrometric path, multidetectors systems.

Recommended literature:
Gamma- nd X-Ray spectrometry with semiconductor detectors / Klaus Debertin, Richard G. Helmer. Amsterdam : Elsevier, 1988

Languages necessary to complete the course:
Slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 11

A	B	C	D	E	FX
9,09	27,27	18,18	18,18	27,27	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD.

Last change: 16.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-542/25	Research Project Seminar

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: 6.

Educational level: I.II.

Prerequisites:

Course requirements:
Interim assessment: individual presentation, discussion
Scale of assessment (preliminary/final): Indicative grading scale: A 90%, B 80%, C 70%, D 60%, E 50% Weighting of midterm/final grades: 100/0

Learning outcomes:
Partial presentations on the literature, background of the research problem and objectives of the research project, methodology and own results.

Class syllabus:
Moderated presentations covering: information from the literature and background to the research problem; formulation of the research hypothesis and specific project objectives; experimental design and experimental and theoretical methodologies used to address the project objectives; processing, evaluating and communicating own results, interpreting and discussing results; and formulating conclusions.

Recommended literature:
Biophysics : a physiological approach / Patrick F. Dillon. Cambridge : Cambridge University Press, 2012
Introduction to experimental biophysics : Biological methods for physical scientists / Jay Nadeau. Boca Raton : CRC Press, 2012
Biomedical devices and their applications / D. Shi (Ed.). Berlin : Springer, 2004 Základy statistiky pro biomedicínské obory / Jana Zvárová. Praha : Karolinum, 2011
Spracovanie experimentálnych dát / František Kundracik, Jozef Masarik, Štefan Dubnička. Bratislava : Univerzita Komenského, 1999
Sprievodca metodológiou kvalitatívneho výskumu / Peter Gavora. Bratislava : Univerzita Komenského, 2007
How to report statistics in medicine : Annotated guidelines for authors, editors, and reviewers / Thomas A. Lang, Michelle Secic. Philadelphia : American College of Physicians, 1997

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: prof. RNDr. Iveta Waczulíková, PhD.

Last change: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I., I.II., 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: 738

A	B	C	D	E	FX
57,86	16,53	10,98	4,2	1,76	8,67

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I., I.II., 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: 435

A	B	C	D	E	FX
63,91	16,09	8,97	3,91	0,92	6,21

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 9.

Educational level: I., I.II., 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: 212

A	B	C	D	E	FX
69,34	17,92	8,96	2,36	0,0	1,42

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 10.

Educational level: I., I.II., 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: 153

A	B	C	D	E	FX
74,51	14,38	7,19	2,61	0,65	0,65

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAMŠ/2-EFM-140/22	SQL Databases

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: 5.

Educational level: I., I.II., II.

Prerequisites:

Course requirements:
Preliminary semester evaluation: active participation
Final examination: oral, semestral project
Approximate grade thresholds: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): Scale of assessment (preliminary/final): 20/80

Learning outcomes:
By completing the course, the student will gain the ability to work with databases, including database model design, creation in common SQL databases, and user interface programming in python, R, C ++, Matlab

Class syllabus:
Introduction to databases, database technologies, database models
Relational database model
SQL language
Relational databases
User rights in SQL
Database API
Interfaces for working with databases (web interface, CLI, GUI)
SQL programming (implementation in R, Matlab, Python, C ++)

Recommended literature:
Daniel Schneller, Udo Schwedt, MySQL Admin Cookbook, Packt Publishing Ltd. 2010
https://goalkicker.com/MySQLBook/MySQLNotesForProfessionals.pdf
Graeme Simsion, Graham Witt, Data Modeling Essentials, Elsevier 2004, ISBN: 9780080488677

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 145					
A	B	C	D	E	FX
51,03	13,79	10,34	11,72	6,9	6,21
Lecturers: doc. Mgr. Róbert Breier, PhD., doc. RNDr. Tibor Ženiš, PhD.					
Last change: 20.06.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-IKVa-192/19	Science, Technology and Humanity: Opportunities and Risks

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: 5

Recommended semester: 2.

Educational level: I., I.II., II.

Prerequisites:

Course requirements:
Semestral evaluation: active participation
Final evaluation: essay
Weight of the final evaluation: 60%
To achieve an A, 90% is needed, for B at least 80%, for C 70%, for D, 60% and for an E, at least 50% of overall assessment.

Learning outcomes:
The students will gain awareness of the contemporary and potential future challenges posed by scientific and technological innovations and their impact on human behaviour, culture and society.

Class syllabus:
Big data: privacy, politics and power,
Internet of things, it usefulness and threats,
Assistant AI and its place in future society,
Job market and inequality,
Enhancements and human rights and the right to change self and others,
Initiatives for responsible research,
Artificial minds,
Hybridization between species and between AI and organic minds,
Future of minds and trans-humanism,
Artificial emotional intelligence,
An after human era.

Recommended literature:
- S. Russell: Human compatible. Artificial intelligence and the problem of control. Viking, 2019.
- J. Havens: Heartificial intelligence. Embracing our humanity to maximize machines. Penguin, 2016.
- P. Boddington: Towards a code of ethics for artificial intelligence. Springer, 2017.
- M. Shanahan: The technological singularity. MIT Press, 2015.

- C. MacKellar, C.: Cyborg Mind: What Brain–Computer and Mind–Cyberspace Interfaces Mean for Cyberneuroethics. Berghahn Books, 2019.
- G. Bel, J. Gemmell: Total Recall, How the e-Memory Revolution will change everything. Dutton, 2009.
- S. Zuboff: The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power. PublicAffairs, 2019.
- C. O'Neil: Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. Crown Publishers, 2016.
- M. Tegmark: Life 3.0. Allen Lane, 2017.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 146

A	B	C	D	E	FX
40,41	21,92	16,44	6,85	4,79	9,59

Lecturers: doc. RNDr. Martin Takáč, PhD., PhDr. Ing. Tomáš Gál, PhD.

Last change: 28.02.2020

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I., I.II., II., III.

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: 113

A	ABS	B	C	D	E	FX	NEABS
32,74	23,89	8,85	6,19	0,88	0,0	24,78	2,65

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I., I.II., II., III.

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: 86

A	ABS	B	C	D	E	FX	NEABS
62,79	18,6	1,16	1,16	0,0	0,0	9,3	6,98

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 9.

Educational level: I., I.II., II., III.

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: 32

A	ABS	B	C	D	E	FX	NEABS
59,38	3,13	18,75	3,13	3,13	0,0	12,5	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 10.

Educational level: I., I.II., II., III.

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: 25

A	ABS	B	C	D	E	FX	NEABS
84,0	0,0	4,0	4,0	0,0	0,0	8,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/1-INF-175/00	Social Aspects of Informatics

Educational activities:
Type of activities: course
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., I.II.

Prerequisites:

Antirequisites: FMFI.KDMFI/1-UXX-332/22

Course requirements:
Three essays submittied during the semester, each for 15 points. Grades: A 41-45 points, B 36-40, C 31-35, D 26-30, E 21-25.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will be motivated to think about the impact of information and communication technologies on our lives. Students will be familiar with historical perspective of this impact.

Class syllabus:
New ICT are developed and improved very rapidly. They are becoming an invisible part of our everyday life. We try to look at changes introduced by ICT, what positive they are introducing and what the risks are too. We try to analyse different areas of society: education system, medical care, arts, business, finance, manufacturing, etc. Especially we deal with Slovak copyright law and computer crime.

Recommended literature:
Abelson,Ledeen, Lewis, BlownTo Bits, Addison Wesley 2008, www.bitsbook.com
Materials shared at the course website

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1914

A	B	C	D	E	FX
70,01	8,31	4,23	10,82	2,87	3,76

Lecturers: doc. RNDr. Daniel Olejár, PhD., RNDr. Michal Winczer, PhD.

Last change: 21.06.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I., I.II., 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: 139					
A	B	C	D	E	FX
21,58	12,95	14,39	12,95	18,71	19,42
Lecturers: RNDr. Patrik Mihala, PhD.					
Last change: 15.03.2022					
Approved by: prof. RNDr. Iveta Waczulíková, PhD.					

COURSE DESCRIPTION

Academic year: 2025/2026

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: 7.

Educational level: I.II., 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: 155

A	B	C	D	E	FX
62,58	27,1	6,45	2,58	0,0	1,29

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: 154

A	B	C	D	E	FX
63,64	27,92	3,9	1,3	2,6	0,65

Lecturers: RNDr. Milan Zvarík, PhD.

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 8.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 9.

Educational level: I.II., 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: 65

A	B	C	D	E	FX
98,46	0,0	1,54	0,0	0,0	0,0

Lecturers: prof. RNDr. Iveta Waczulíková, PhD.

Last change: 12.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 7.

Educational level: I.II., 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: 160

A	B	C	D	E	FX
98,75	0,0	0,0	0,0	0,0	1,25

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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., 8.

Educational level: I.II., 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: 109

A	B	C	D	E	FX
95,41	0,0	0,0	0,0	0,0	4,59

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-115/15	Sports in Nature (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: I., I.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 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 does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 300

A	B	C	D	E	FX
99,0	0,33	0,33	0,0	0,0	0,33

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-215/15	Sports in Nature (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: I., I.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: 297

A	B	C	D	E	FX
92,59	0,0	0,0	0,0	0,34	7,07

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-216/18	Sports in Nature (3)

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

Number of credits: 1

Recommended semester: 3.

Educational level: I., I.II.

Prerequisites:

Antirequisites: FMFI.KTV/1-UXX-151/22

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: 55

A	B	C	D	E	FX
98,18	0,0	0,0	0,0	0,0	1,82

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/1-MXX-217/18	Sports in Nature (4)

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

Number of credits: 1

Recommended semester: 4.

Educational level: I., I.II.

Prerequisites:

Antirequisites: FMFI.KTV/1-UXX-152/22

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 material equipment.

Past grade distribution
Total number of evaluated students: 40

A	B	C	D	E	FX
90,0	0,0	0,0	0,0	0,0	10,0

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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-133/18	Supplementary English 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.

Educational level: I., I.II.

Prerequisites:

Course requirements:
tests, homework
Scale of assessment (preliminary/final): 100/0 credit - ongoing evaluationMinimum 65 percent of the total points for the assigned work is needed to pass the course. Points can be awarded for attendance, completed homework tasks, and short tests assigned during the course.A 100-93 %B 92-85 %C 84-77 %D 76-70 %E 69-65 %Course prerequisites:https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/

Learning outcomes:

Class syllabus:
Texts dealing with the most important topics for FMPI majors combining grammar revision with vocabulary needed to pass the A4 English exam.

Recommended literature:
Study materials are created by the teacher and available in electronic form.
Raymond Murphy: Essential Grammar in USe, Cambridge University Press, 1998
Michael McCarthy, Felicity O'Dell: English Vocabulary in Use, Cambridge University Press, 1994

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 68

A	B	C	D	E	FX
51,47	20,59	7,35	4,41	4,41	11,76

Lecturers: Mgr. Ing. Jana Kočvarová

Last change: 11.04.2024
Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-134/18	Supplementary English 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.

Educational level: I., I.II.

Prerequisites:

Course requirements:
tests, homework
Scale of assessment (preliminary/final): 100/0 ENcredit - ongoing evaluation Minimum 65 percent of the total points for the assigned work is needed to pass the course. Points can be awarded for attendance, completed homework tasks, and short tests assigned during the course. A 100-93 % B 92-85 % C 84-77 % D 76-70 % E 69-65 %Course prerequisites:https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/

Learning outcomes:

Class syllabus:
Texts dealing with the most important topics for FMPI majors combining grammar revision with vocabulary needed to pass the A4 English exam.

Recommended literature:
Study materials are created by the teacher and available in electronic form. Raymond Murphy: Essential Grammar in USe, Cambridge University Press, 1998 Michael McCarthy, Felicity O'Dell: English Vocabulary in Use, Cambridge University Press, 1994

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 72

A	B	C	D	E	FX
54,17	13,89	4,17	8,33	5,56	13,89

Lecturers: Mgr. Ing. Jana Kočvarová

Last change: 11.04.2024

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-167/15	Text and Data Sets Processing

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

Number of credits: 3

Recommended semester: 1.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: homeworks
Final exam: practice
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 work with the advanced features of the available spreadsheets processors, text editors and presentation programs as well as the basics of database systems.

Class syllabus:
Text formatting, use of styles, document division (paragraphs, sections), creation of content, registers, and bibliographies, work with objects and fields, macros. Cell addressing, filtering, sorting and formatting of data, graphing, trend interpolations, conditional calculations, database and search functions, special mathematical methods, data analysis. Presentation formatting, use of templates and themes, presentation effects, comments. Introduction to database systems, table records processing, relational databases and queries, forms, report creation. Applications on examples from biomedical physics and biophysics.

Recommended literature:
Excel pokročilé nástroje funkce, databáze, kontingenční tabulky, prezentace, příklady / Marek Laurenčík. Praha: Grada, 2016
Access 2013 podrobný průvodce / Slavoj Písek. Praha: Grada, 2013
Online príručka a školenia dostupné na: https://support.microsoft.com/sk-sk

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 81

A	B	C	D	E	FX
79,01	16,05	3,7	0,0	0,0	1,23

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

Last change: 13.03.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FBM-954/25	**Course title:** Theoretical Fundamentals of Medicine
Number of credits: 2	
Educational level: I.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. Spine, vertebrae, joints, function 2. Chest, skeleton, connections, function 3. Skull bones 4. Skeleton of the upper limb, conjunctions 5. Skeleton of the lower limb, conjunctions 6. Pelvis 7. Oral cavity, pharynx, oesophagus, stomach, and their function 8. Small and large intestine, and their function 9. Liver, bile ducts, gallbladder, pancreas, and their function 10. Nasal cavity, larynx, trachea, and their function 11. Bronchi, lungs, and their function 12. External description of heart, cavities and valves of heart, and their function 13. Transmission system and blood vessels of heart, function 14. Pulmonary blood circulation, physiological properties 15. Body blood circulation, physiological properties 16. Excretory system, functions 17. Medulla spinalis, medulla oblongata, pons, cerebellum, and their function 18. Mesencephalon, diencephalon, and their function 19. Telencephalon, primary, secondary and tertiary and associative cortical areas 20. CNS cavities and casings 21. Autonomic nervous system, and their function 22. Epithelial tissue, and its function 23. Muscle tissue, supportive and connective tissue 24. Blood and haematopoiesis, blood groups, blood clotting 25. Nerve tissue, neuron, its function 26. Microscopic anatomy of cardiovascular system (heart, arteries, capillaries, veins) and respiratory system 27. Microscopic anatomy of digestive system (hollow organs of the digestive system, glandular organs of digestive system (salivary glands, liver, pancreas, gallbladder)) 28. Microscopic anatomy of central and peripheral nervous system, and endocrine glands	

29. Homeostasis
30. Negative and positive feedback
31. Endocrine system
32. Neuron, nerve excitement, resting membrane potential, receptor potential, action potential, neuromuscular transmission
33. Reflex arc
34. Basic physiological properties of heart muscle (automation, conductivity, irritability, contractility)
35. Cardiac cycle
36. Cardiac output, preload, contractility, afterload
37. ECG
38. Blood flow in blood vessels, blood pressure, factors influencing blood pressure
39. Blood capillaries, hydrostatic and oncotic pressure in capillaries
40. Nervous and humoral regulation of cardiovascular system activity
41. Ventilation, tidal volumes, dead space
42. Diffusion, perfusion, transmission of respiratory gases in blood, oxygen supply
43. Nephron and its function, glomerular filtration, tubular processes in kidneys
44. The role of kidneys and respiration in regulation of acid-base balance, blood pH, maintenance of acid-base balance
45. Sensory perception, sight, hearing, taste, smell, balance, pain
46. Movement regulation
47. Bioenergetics (glycolysis, Krebs cycle, oxidative phosphorylation)
48. Nutrition, work metabolism, thermoregulation
49. Atrophy, dystrophy, necrosis
50. Hypertrophy, hyperplasia
51. Disorders of ventilation, diffusion and perfusion
52. Types of hypoxia
53. Lung diseases caused by pollutants in the inhaled air
54. Chronic respiratory diseases (bronchitis, emphysema, asthma)
55. Respiratory insufficiency
56. Anemia
57. Leukocyte disorders
58. Contraction-relaxation cycle of the heart muscle
59. Myocardial contractile function, pump function of the heart
60. Hypertrophy of the heart
61. Cardiomyopathy
62. Heart failure
63. Acquired heart defects
64. Congenital heart defects
65. Systemic arterial hypertension
66. Shock states
67. Atherosclerosis
68. Ischemic heart disease, angina pectoris, myocardial infarction
69. Pulmonary hypertension, cor pulmonale
70. Pathophysiology of cerebral circulation, intracranial hemorrhage, cerebral infarction
71. Electrophysiological basis of heart rhythm disorders
72. Disorders of sinusoatrial node function, disorders of A-V conduction, tachyarrhythmias
73. Diseases of the venous system
74. Disorders of glomerular function, glomerulonephritis, glomerulopathy

75. Renal failure
76. Diabetes mellitus
77. Intracranial hypertension
78. Liver cirrhosis, portal hypertension, ascites, liver failure
79. Jaundice
80. Generalized skeletal disorders
81. Dehydration, hyperhydration
82. Disorders of electrolyte economy (Na +, K +, Ca2 +)
83. Disorders of acid-base balance
84. Pathophysiology of the thyroid gland
85. Pathophysiology of parathyroid glands

State exam syllabus:

Recommended literature:
Harsh Mohan: Patológia. KNIŽNICA LF UK
Recommended study literature--

Languages necessary to complete the course:
Slovak, English

Last change: 25.05.2025

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/1-BMF-351/15	Thermodynamics and Statistical Physics

Educational activities:
Type of activities: course
Number of hours:
per week: 5 **per level/semester:** 65
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 6.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Preliminary evaluation: individual work - project (30 %)
Final exam: written and oral (70 %)
Indicative evaluation scale: A (100 % -91 %), B (90 % -81 %), C (80 % -71 %), D (70 % -61 %) , E (60 % -51 %), Fx (50 % -0 %).
Scale of assessment (preliminary/final): 30/70
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After the course, students are able to use the principles and methods of thermodynamics and statistical physics in practice.

Class syllabus:
Mathematiical introduction, probability and statistics. First law of thermodynamics. Second law of thermodynamics. Heat engines. Entropy from thermodynamics point of view. Ideal gas. Statistics of system of spins. Statistics of particles in a box. Termal contact between physical systems. System in termal contact with reservoir. Canonical distribution. Paramagnetism. Curie's law. Mean energy of an ideal gas of monoatomic molecules. Entropy change at low heat transfer, entropy measurement principle. Statistical physics of classical particles (concept of state and number of available states for the classical system, canonical distribution in the classical approximation, equipartition law, specific heat capacities). Thermal and diffusion contact between systems (thermal and diffusion equilibrium conditions, chemical potential, large canonical distribution). Quantum ideal gases (Fermi and Bose statistics. Quantum ideal gas in the classical limit. Boltzmann distribution. Barometric formula, chemical reactions, statistics of conductivity electrons in metal. Fermi energy of degenerate gas. Phase equilibrium and phase transitions. Transfer phenomena.

Recommended literature:
Statistická fyzika / Jozef Kvasnica. Praha : Academia, 1983 Štatistická fyzika / Rudolf Zajac, Ján Pišút. Bratislava : Univerzita Komenského, 1995 Termodynamika a štatistická fyzika : Zbierka úloh / František Čulík, Rudolf Zajac. Bratislava : Univerzita Komenského, 1985 Úvod

do štatistickej fyziky a termodynamiky / Milan Noga, František Čulík. Bratislava : Univerzita Komenského, 1975

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 107

A	B	C	D	E	FX
29,91	22,43	22,43	14,95	9,35	0,93

Lecturers: prof. RNDr. Stanislav Tokár, DrSc., doc. RNDr. Radoslav Böhm, PhD., doc. Mgr. Pavol Bartoš, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

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: 10.

Educational level: I.II., 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: prof. RNDr. Iveta Waczulíková, PhD.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-UFY-210/22	Waves and Optics

Educational activities:
Type of activities: lecture / course
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2.

Educational level: I., I.II.

Prerequisites:

Course requirements:
Continuous assessment: written tests (2x10 marks), lab reports (2x15 marks)
Exam: written (30 marks), oral (20 marks)
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Credits will be awarded if the student obtains at least 50% marks.

Learning outcomes:
Graduates have a systematic knowledge of mechanical waves (including sound) and wave optics at the level of a core university physics course. They have an idea of the boundaries between graduation and university physics in the field of wave optics from the point of view of work with high school youth with an increased interest in physics.

Class syllabus:
Oscillations and oscillating systems (modes, resonators, oscillations and waves, Fourier analysis of oscillations). Waves (harmonic waves, complex notation, wave superposition, wave polarization, Doppler effect, wave diffraction, waves in physics, and waves at boundaries). Wave optics (light interference, light diffraction, holography, light dispersion in dielectrics, dispersion, polarization by reflection and refraction, spreading of light in anisotropic conditions). Geometrical optics and basics of optical projection. Photo metrics. Contemporary problems in optics.

Recommended literature:

Languages necessary to complete the course:
Slovak ad English.

Notes:

Past grade distribution
Total number of evaluated students: 156

A	B	C	D	E	FX
26,92	21,79	26,92	15,38	8,33	0,64

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 18.06.2022
Approved by: prof. RNDr. Iveta Waczulíková, PhD.