Course descriptions

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COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-037/22	Advanced Practical in Biochemistry

Educational activities:
Type of activities: practicals
Number of hours:
per week: 8 **per level/semester:** 112
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: practicals
Number of hours:
per week: 8 per level/semester: 88
Form of the course: on-site learning

Number of credits: 8

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:
Students write 10-point test each exercise. At the end of the semester, students take final control test, from which they must attain at least 50%. Students, who achieved more then 50% of the total assessment, will be evaluated as follows: ≥90% A, ≥80% B, ≥70% C, ≥60% D, ≥50% E. Credits will not be awarded to a student who receives less than 50% of the total assessment (control test and activity during the semester). Scale of assessment (preliminary/final): 60/100 ongoing/ 40/100 final exam (60% ongoing /40% final exam).

Learning outcomes:
Students acquire advanced laboratory skills in biochemical, molecular biological and microbiological techniques. After completing this course students should be able to apply in biochemical and biomedical research.

Class syllabus:
Advanced Practice in Biochemistry is a set of modern laboratory methods in biochemistry, molecular and cell biology. This course will enable students to acquire skills in following techniques:
1. Isolation and restriction analysis of yeast mitochondrial DNA.
2. Egg-white lysozyme purification using ion-exchange chromatography.
3. Yeast Saccharomyces cerevisiae use for transcription studies.
4. Yeast Saccharomyces cerevisiae lipid extraction and separation.
5. Specific antibody determination using ELISA.

Recommended literature:
Lodish,H. et al.(2016), Molecular Cell Biology, 8th edition, W.H Freeman and Company
J.M.Berg et al. (2015), Biochemistry, 8th edition, W.H Freeman and Company

Sambrook, J., Fritsch, E.F. a Maniatis, T. (1989) Molecular cloning: A laboratory manual, Cold Spring Harbor Laboratory Press

Languages necessary to complete the course:
English

Notes:
course is available in summer semester only

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
0,0	62,5	37,5	0,0	0,0	0,0

Lecturers: Ing. Martina Neboháčová, PhD., Mgr. Stanislav Huszár, PhD., Mgr. Filip Brázdovič, PhD., doc. RNDr. Igor Zeman, PhD., Mgr. Júlia Zemanová, PhD.

Last change: 27.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAlCh/N-bBCH-037/22	Analytical Chemistry

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 5 / 4 **per level/semester:** 70 / 56
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Number of contact hours:
per week: 4 / 5 per level/semester: 56 / 70
on-site learning

Number of credits: 9

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Lecture – a maximum of 50 points, for the final test. Practicals – a maximum of 50 points, for theoretical preparation for practicals, active participation in practicals, lab reports from practicals and final test from practicals. The final grade will consist of evaluation of the practicals and the final test from lecture, for a maximum of 100 points. For grade A it is necessary to obtain at least 92 points, for grade B at least 84 points, for grade C at least 76 points, for grade D at least 68 points and for grade E at least 60 points. The evaluation is the same for on-line learning.

Learning outcomes:
Students will get acquainted with the current state of quantitative observation; generation of analytical signal; analytical processes, principles, procedures and techniques and their classification; solving identification problems; and characterization and quantification of chemical substances in science and technology. Students will also get acquainted with the possibility of detecting and finding solutions to materials research, production and social practice using chemical analysis as a tool of analytical chemistry. Students will also get acquainted with instrumental experimental work in the laboratory.

Class syllabus:
• Definition, subject of interest and resources of analytical chemistry.
• Relationship between analytical chemistry and chemical analysis. Analytical method (classification). Analytical principle. Sampling.
• Measurement (qualitative and quantitative analysis). Analytical signal and its properties. Calibration. Statistical evaluation of data (measurement errors).
• Simple sample preparation procedures. Decomposition of inorganic and organic samples, extraction.

• Chemical methods of analysis (qualitative, quantitative). Evidence of chemical reactions and tests, gravimetric analysis, volumetric analysis. Titration curves. Principles of neutralization, precipitation, redox and complexometric titrations.
• Chemical equilibria (acid-base, complex-forming, precipitating, redox).
• Electroanalytical methods. Basic scheme of electrochemical cell. Classification of electroanalytical methods. Equilibrium potentiometry (reference and indicator electrodes, direct potentiometry and potentiometric titrations, ion-selective electrodes as a selectivity coefficient). Principle and use of linear and cyclic voltammetry, coulometry and conductometry.
• Optical analytical methods. Properties of electromagnetic radiation. History and classification of optical methods. Basic instrumentation of optical analytical methods. Atomic spectrometry. Atomic spectrometry techniques.
• Molecular spectrometry. Molecular spectrometry techniques – absorption UV-VIS spectrophotometry, spectrofluorometry, infrared and Raman spectrometry. Non-spectral optical methods. Reflectometry, interferometry, polarimetry, turbidimetry and nephelometry.
• Mass spectrometry. Basic principles. Basic scheme of equipment. Measurement conditions. Instrumentation in mass spectrometry. Basic types of ionization techniques and ion sources.
• Separation techniques, their function and importance in analytical procedures. Classification of separation principles and methods. Precipitation and filtration. Separation of volatile substances by distillation. Isolation and separation of substances by extraction. Ion-exchange. Chromatographic separation. Classification of chromatographic methods. Gas chromatography – principles and instrumentation. High-performance liquid chromatography – principle and instrumentation. Electroseparation methods. Capillary electrophoresis vs planar techniques. Instrumentation. Basic principles of electrophoretic methods: zone electrophoresis, isotachophoresis, isoelectric focusing.
• Automation in analytical laboratories. The application of combined analytical methods to solve selected analytical problems.
Practicals
• Volumetric analysis. Determination of calcium and magnesium in water.
• Potentiometric analysis. Determination of acetic acid in fermented spirit vinegar.
• Optical analytical methods. Determination of calcium and sodium in mineral water by emission flame photometry. Spectrophotometric determination of copper in the water. Identification and quantification of synthetic dyes by molecular absorption spectrometry.
• Chromatographic separation methods. Determination of methanol in alcoholic beverages by GC. RP-HPLC separation of aromatic hydroxycompounds and gallic acid. Separation of water-soluble dyes by paper chromatography.
• Electroseparation methods. Isotachophoretic separation of synthetic dyes using column-coupling technique. Isotachophoretic determination of glutamate in food.

Recommended literature:

D.A. Skoog, F.J. West, F.J. Holler, S.R. Crouch: Analytical Chemistry. An Introduction, Saunders Coll. Publ., 2000.
G. Schwedt: The Essential Guide to Analytical Chemistry, Wiley, New York, 1997.
R. Kellner, J.M. Mermet, M. Otto, Analytical Chemistry, John Wiley & Sons Australia, 2013.
For practicals: study material available at www.analytika.sk

Languages necessary to complete the course:

English

Notes:

The course is provided only in the summer semester.

Past grade distribution
Total number of evaluated students: 11

A	B	C	D	E	FX
18,18	18,18	45,45	0,0	9,09	9,09

Lecturers: prof. RNDr. Marian Masár, PhD., Ing. Roman Szücs, PhD., Mgr. Jasna Hradski, PhD.

Last change: 03.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KŽFE/N-bBCH-023/22	Animal and Human Physiology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture
Number of contact 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.

Prerequisites:

Course requirements:
Final exam is in the form of a written test. Student is evaluated by A (if obtains at least 90% of total score), B (if obtains at least 82% of a total score), C (if obtains at least 75% of a total score), D (if obtains at least 68% of a total score), E (if obtains at least 60% of a total score) and Fx (if obtains less than 60% of a total score).

Learning outcomes:
The course brings the background needed to understand the fundamental processes and mechanisms that control the various body functions. By the end of this course students should be able to understand general aspects of animal and human physiology, to integrate concepts and approaches from regulatory mechanisms from the level of animal cell to the entire organism, and to understand control systems, including cardiovascular, gastrointestinal, respiratory, excretory, immune, reproductive, endocrine and nerve systems.

Class syllabus:
Principle of Homeostasis; Cell Physiology; Membrane Transports; Membrane Potential and Cell Signalling; Neuronal Physiology; Gastrointestinal Physiology; Physiology of the Blood; Immune Mechanisms; Cardiovascular Physiology; Respiratory Physiology; Physiology of the Kidneys; Endocrine Physiology; Reproductive Physiology

Recommended literature:
Fox SI: Human Physiology, 14th ed. McGraw-Hill Education, New York, USA, pp 832, 2016.
Constanzo LS.: Physiology, 6th ed. Elsevier, Philadelphia, USA, pp 528, 2018.
Koeppen BM & Stanton BA: Berne & Levy Physiology. Elsevier - Health Sciences Division, St Louis, USA, pp 864, 2008.

Sherwood L et al: Animal Physiology: From Genes to Organisms, 2nd ed. Cengage Learning, Inc, Florence, USA, pp 840, 2013.

Languages necessary to complete the course:

Notes:
This course is available only in winter semester and will be opened if at least 3 students enrol.

Past grade distribution
Total number of evaluated students: 26

A	B	C	D	E	FX
7,69	3,85	7,69	23,08	34,62	23,08

Lecturers: doc. Mgr. Monika Okuliarová, PhD., Mgr. Jana Zlacká, PhD.

Last change: 02.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAgCh/N-bBCH-036/22	Applied Calculations in Chemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
The seminars are evaluated during the term in the form of two written exams. It is possible to get the maximum of 30 points for the first exam and the maximum of 70 points for the second exam. Grade scale: A 92-100%, B 84-92 %, C 76-84 %, D 68-76 %, E 60-68 %, FX 60 % and less.

Learning outcomes:
By completing the course, the student will acquire the necessary knowledge to implement the basic chemical calculations in the field of stoichiometry, solutions, ideal gas and their mutual
· combinations. Upon successful completion of the education process, the student will be able to be prepared independently for the laboratory exercises in inorganic, organic, and physical chemistry, and in subsequent years to understand subjects related to chemical calculations.

Class syllabus:
Physical quantities used in chemical calculations (extensive, intensive). Weight, volume, density, number of particles (moles), mass, molar mass, molar volume. Rounding results of the calculations. Stoichiometry of chemical compounds. Stoichiometry of chemical equations. Calculations according to chemical equations. Determination of the determining reactant and reactant in excess. Calculations using ideal gas laws. Quantities expressing the composition of solutions. Calculations with the weight fraction. Calculations with substance concentration. Mixing and dilution of solutions. Calculations for the preparation of solutions from anhydrous substances and hydrates. Preparation of saturated solutions. Recalculations of different ways for defining the composition of solutions. Combined calculations - calculations according to chemical equations and calculations related to solutions. Combined calculations - calculations related to syntheses.

Recommended literature:
[1] M. Bishop: An Introduction to Chemistry, Chemistry First. ISBN 978-0-9778105-8-1 (online source); Chapter 10: https://preparatorychemistry.com/Bishop_Chemistry_First.htm; [2] E. N. Ramsden: Calculations for A-level Chemistry, Redwood Books, Trowbridge, Wiltshire, 1993, ISBN 0-7487-1594-0

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 13

A	B	C	D	E	FX
38,46	15,38	0,0	38,46	7,69	0,0

Lecturers: doc. Mgr. Olivier Monfort, PhD.

Last change: 27.03.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-019/22	Bachelor seminar 1

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
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.

Prerequisites:

Course requirements:
Assessment will be based on the student's work throughout the semester. A Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D Less acceptable work, relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Students will get acquainted with the basics of professional presentation. They will also get familiar with professional and formal requirements that are placed on the final theses and their defence in the bachelor's degree program of biochemistry. They will learn to process knowledge in the form of research, present an overview of scientific work in writing and through a lecture. The Bachelor seminar offers an opportunity for Bachelor students to present and discuss their work in progress.

Class syllabus:
Formal requirements for Bc. work at Comenius University, Rector's Directive. Sources of professional literature, work with databases. Principles of oral presentation of professional results. Publishing in professional journals, parameters of scientific journals quality, predatory journals.

Progress reports of writing Bc. thesis and about communication with supervisors. Participants are expected to read and provide constructive feedback to the draft chapters.

Recommended literature:
Specifically, as recommended by supervisor

Languages necessary to complete the course:
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. Anton Horváth, CSc.

Last change: 27.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KŽFE/N-bBCH-020/22	Bachelor seminar 2

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: seminar
Number of contact 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.

Prerequisites:

Course requirements:
Active participation in the course is mandatory. Final grade is based on the quality of 2 presentations and student's ability to discuss their own and another research projects, as well as original research papers in the field.
Standardized grading system is identified below:
A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyse, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80%): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyse, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyse or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Bachelor seminar is designed to improve presenting skills and abilities to discuss obtained knowledge and to develop independent thinking in bachelor students. Students are required to present a progress in writing of their Bachelor thesis; they are encouraged to discuss any formal or scientific issues that rise during preparing of their work.

Class syllabus:
Bachelor students present and discuss their work in progress. During the semester each student prepares two presentations. The one will refer to a selected or assigned research paper from the

field of biology or chemistry. In the second presentation, students introduce the aim and highlight the main topics of their Bachelor thesis. All students are expected to join the discussion and provide feedback to presenting colleagues.

Recommended literature:
Research papers related to the topic of bachelor thesis.

Languages necessary to complete the course:
English

Notes:
This course is available only in summer semester.

Past grade distribution
Total number of evaluated students: 7

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

Lecturers: doc. Mgr. Monika Okuliarová, PhD.

Last change: 02.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-021/22	Bachelor theses

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:
Grading Policy (Assessment/Evaluation): Grades will be based on the final Bachelor thesis report (contributing 100%), which has a standardized grading system identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80%): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
The Bachelor thesis serves to improve skills and abilities for independent research in final Bachelor thesis. The primary task is to prepare own Bachelor thesis which will be discussed and reviewed individually by each supervisor.

Class syllabus:
The course in individual and consultative design offers an opportunity to complete and submit Bachelor thesis as well as to present and discuss work in progress. Participants are expected to read and provide constructive feedback to the draft chapters. There is no specific syllabus for this type of seminar. The content is given by the topic of the Bachelor thesis.

Recommended literature:
Specifically, as recommended by supervisor

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
71,43	28,57	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Anton Horváth, CSc., doc. Mgr. Monika Okuliarová, PhD.

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAn/N-XXXX-005/21	Bioarchaeology

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., 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: 1110

A	B	C	D	E	FX
75,23	11,17	5,95	2,79	0,81	4,05

Lecturers: doc. RNDr. Radoslav Beňuš, PhD., Mgr. Silvia Bodoriková, PhD., prof. Mgr. Viktor Černý, Dr.

Last change: 07.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-034/22	Biochemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 56
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: lecture
Number of hours: per week: 4 per level/semester: 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:
The exam will consist of the written part (A) and the oral part (B).
Part A (70%):
14 questions (multiple choice, short answer)
7 correct answers are needed to qualify for the part B
Part B (30%):
3 questions
Failure to answer at least one of these questions means failing the exam.
Final grade: 100-90% A, 89-80% B, 79-70% C, 69-65% D, 64-60% E, Fx-less then 60%

Learning outcomes:
Students are introduced to biochemical processes taking place in living organisms. After completing the course they will understand chemical structure of biomolecules in relation to their functions, they will comprehend basics of enzyme catalysis and intermediary metabolism.

Class syllabus:
1. Carbohydrates. Classification, physico-chemical and biological properties of carbohydrates. Stereochemistry: configuration, conformation, enantiomer, epimer, diastereomer, mutarotation, α-, β-anomers. Glycosidic bond. Oligosaccharides and polysaccharides. Structural polysaccharides, storage polysaccharides - bonds, structures.
2. Amino Acids and Proteins. General formula of AA, classification of AA, formulas of AA, optical activity, spectroscopic properties of AA, acid-base properties of AA, zwitterions, amphoteric character of AA, isoelectric point, structure and properties of the peptide bond. Three-dimensional structure of proteins - primary, secondary (α-helix, β-pleated sheet, β-turn), tertiary, quaternary; bonds (interactions) and functional groups implied in these structures. Classification of proteins according to structure and solubility (fibrous, globular, membrane proteins). Biological functions of proteins, native conformation, denaturation, renaturation.

3. Enzymes. Holoenzyme, apoenzyme, cofactor, coenzyme, prosthetic group. Classification of enzymes. Active site, specificity of enzymes. Mechanism of action of enzymes – "lock and key", "induced fit". Activation energy, transition state. Enzyme kinetics, Michaelis - Menten equation, parameters KM and Vmax; enzyme inhibition - irreversible, reversible - competitive, uncompetitive, mixed. Regulation of enzyme activity - allosteric modification, covalent modification, regulatory proteins, proteolytic cleavage (zymogens).
4. Lipids and Membranes. Functions of the lipids. Structure and properties of fatty acids. Storage lipids: triacylglycerols (fats, oils), waxes. Membrane lipids: glycerophospholipids, sphingolipids, sterols. Amphipathic character of some lipids, aggregated forms of lipids - micelles, bilayers. Biological membranes, membrane proteins, fluid mosaic model.
5. Introduction to metabolism. Sources and transformations of energy in the biosphere. Laws of thermodynamics (1st and 2nd). Chemical energy - enthalpy, free (Gibbs) energy, entropy. Endergonic, exergonic reactions. Carriers of chemical energy. ATP – its role and production in the living systems (substrate-level phosphorylation, oxidative phosphorylation, photophosphorylation). Catabolic and anabolic metabolic pathways. Energy relationships between catabolic and anabolic pathways. Oxidation of biomolecules.
6. Metabolism of glucose. Glucose as a source of metabolic energy. Glycolysis - significance, localization, 2 phases of glycolysis, individual reactions, intermediates and enzymes of glycolysis. Fate of pyruvate. Lactic fermentation, alcoholic fermentation. Gluconeogenesis - significance, substrates, three unique gluconeogenetic steps (4 enzymes), localization. Cori cycle, transfer of lactate from muscle to liver, formation of glucose from lactate. Pentose phosphate pathway: significance, formation of NADPH, ribulose-5-phosphate, reactions catalyzed by dehydrogenases, isomerase, epimerase, transaldolases, transketolase.
7. Krebs cycle. Glyoxylate cycle. Formation of acetyl-coenzyme A from pyruvic acid. Krebs cycle as a source of energy and biosynthetic precursors, cellular localization of the cycle. Krebs cycle reactions, individual intermediates and enzymes. Amphibolic character of the citrate cycle, anaplerotic reactions (pyruvate carboxylase). Glyoxylate cycle - importance for plants and bacteria, localization, enzymes.
8. Metabolism of fatty acids. Fatty acids as a source of metabolic energy. Fats digestion - bile acids, lipases, chylomicrons. The fate of fatty acids in muscle and adipose tissue. Release of fatty acids from adipose tissue and their transfer to tissues. β-oxidation of fatty acids - localization in the cell, transfer of fatty acids to mitochondria (carnitine function). b-oxidation reactions, formation of acetyl-coenzyme A. Fate of acetyl-coenzyme A - entry into the citrate cycle. Fatty acid biosynthesis - comparison with β-oxidation, reactions. Sources of NADPH. Transport of fat and cholesterol in humans, roles of lipoproteins.
9. Oxidative phosphorylation. Structure and functions of mitochondria. Composition and function of the respiratory chain, electron transporters - cytochromes, iron-sulfur proteins, ubiquinone, flavoproteins. The source of electrons entering the respiratory chain. Electron transfer in the respiratory chain (complexes I, II, III, IV, cyt c, ubiquinone). Proton gradient. ATP synthesis, ATP-synthase. Chemiosmotic theory. Alternative use of proton gradient - thermogenesis, movement of bacteria, transport of metabolites.
10. Photosynthesis. Structure and function of chloroplasts. Pigments and their role in photosynthesis. Photochemical reaction centers. Electron transfer by photosystems I and II. Non-cyclic and cyclic photophosphorylation. Photolysis of water. Production of NADPH. Synthesis of carbohydrates during photosynthesis. Three stages of CO2 assimilation. Basic reactions and function of Calvin cycle.
11. Degradation of amino acids and urea cycle; metabolism of nucleotides. Deamination, transamination and decarboxlation of amino acids. Amino-transferases. Fate of NH4+ in various organisms. Urea cycle and its interconnection with citric acid cycle. Biosynthesis of ribonucleotides

and deoxyribonucleotides de novo and by salvage reactions. Degradation of nucleic acids. Degradation of purine and pyrimidine bases.
12. Nucleotides and Nucleic Acids. Nitrogenous bases found in RNA and DNA. Nucleosides and nucleotides – their structure and components (nucleobases, sugar, phosphoric acid). Structure of deoxyribonucleic acid: (i) primary structure; (ii) secondary structure and its discovery; (iii) ABZ forms of the secondary structure; (iv) another alternative forms of the secondary structure (cruciform, G-quadruplex, Hoogsteen base pairing); (v) tertiary structure (supercoils, topoisomerases). DNA replication enzymes and the rules – semiconservative, bidirectional, semidiscontinuous (Okazaki fragments). DNA denaturation. Chromosome structure in eukaryotes – the nucleosome and nuclear DNA packing levels. DNA/RNA differences. Structure of ribonucleic acid: (i) primary structure; (ii) secondary structure; (iii) tertiary structure. Various forms of RNA serving different functions in cell – mRNA, rRNA, tRNA, snRNA, snoRNA, ncRNA.
13. Transfer of genetic information. Transcription: General features of transcription, prokaryotes and eukaryotes comparison. Transcription in prokaryotes: initiation, elongation, termination. Transcription in eukaryotes: initiation, elongation, termination and introduction to the mRNA processing. Inhibitors of transcription in prokaryotes and eukaryotes. Genetic code and Translation: Structure of tRNA. Function of tRNA in translation. Genetic code, its features (triplet code, continuous, not overlapping, degenerate, unambiguous, universal). Decoding of the standard genetic code. Natural and unnatural variations in the standard genetic code. Loading the tRNAs and aminoacyl-tRNA synthetases. Codon-Anticodon pairing. Ribosome, its structure, prokaryotes and eukaryotes comparison. Translation – protein synthesis mechanism and stages: initiation, elongation, termination. Translation elongation cycle three principal steps: codon-directed binding, peptide bond formation (ribosome is ribozyme), translocation. Molecular mimicry. Inhibitors of protein synthesis.
14. Recombinant DNA, artificial manipulation with Nucleic acids. Cloning of DNA: history, plasmids, restriction enzymes, ligases, linkers and polylinkers, shuttle vectors. Genomic gDNA library and complementary DNA cDNA library. Preparation of gDNA library and cDNA library. Particular DNA segment identification by hybridization – Southern blotting. Colony hybridization. Polymerase chain reaction – PCR cycle stages: heating, cooling, polymerization. DNA primary structure determination – DNA sequencing methods: Sanger method and Maxam-Gilbert chemical cleavage method.

Recommended literature:
Nelson, D. L. a Cox, M.M. (2017) Lehninger Principles of Biochemistry, W.H. Freeman;
Berg J.M., Tymoczko J.L., Gatto G.J. a Stryer L. (2019) Biochemistry, MacMillan

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 26

A	B	C	D	E	FX
11,54	3,85	19,23	11,54	30,77	23,08

Lecturers: doc. RNDr. Marek Mentel, PhD., prof. RNDr. Katarína Mikušová, DrSc.

Last change: 16.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-035/22	Biochemistry - practical exercises

Educational activities:
Type of activities: practicals
Number of hours:
per week: 5 **per level/semester:** 70
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:
Students write (10-point) test each exercise. Students have to write a report from each practical task (5-point). Students must attain at least 3 points from each individual test, turn in all lab reports and have least 50% of total points. They will be evaluated as follows: 92% A, 84% B, 76% C, 68% D, 60% E, Fx-less then 60%.

Learning outcomes:
During the exercise, students will practically verify some of the knowledge acquired during lectures and seminars in the subject Biochemistry (1) (N–bCXX–000) and get acquainted with basic biochemical methods.

Class syllabus:
Introduction, safety in the laboratory.
Calculations in the biochemical laboratory.
Carbohydrates - determination of lactose in milk, hydrolysis of disaccharides and testing of reducing properties, thin layer chromatography of carbohydrates.
Animo acids and protein - determination of isoelectric point of casein, test reactions to amino acids and proteins, SDS - polyacrylamide gel electrophoresis. Gel filtration of haemoglobin.
Enzymes - determination of kinetic parameters of beta-galactosidase. Determination of pH optimum and temperature optimum of salivary amylase.
Lipids - determination of cholesterol in the egg yolk.
Photosynthesis.
DNA - plasmid DNA isolation. Bacterial transformation.
Amino acid metabolism - determination of urea in serum and urine, determination of creatinine in serum.

Recommended literature:
Nelson, D. L. a Cox, M.M. (2017) Lehninger Principles of Biochemistry, W.H. Freeman;
Berg J.M., Tymoczko J.L., Gatto G.J. a Stryer L. (2019) Biochemistry, MacMillan
Instructions for each task (will be provided in advance by the exercise teachers).

Languages necessary to complete the course:

English

Notes:
course is available in winter semester only

Past grade distribution
Total number of evaluated students: 21

A	B	C	D	E	FX
9,52	23,81	33,33	4,76	14,29	14,29

Lecturers: doc. Mgr. Peter Polčic, PhD.

Last change: 18.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-024/22	Bioinformatics

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 10

A	B	C	D	E	FX
30,0	40,0	30,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Ján Turňa, CSc., doc. RNDr. Tomáš Szemes, PhD.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAgCh/N-bBCH-034/22	Bioinorganic Chemistry

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 **per level/semester:** 28 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 per level/semester: 28 / 14
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: I.

Prerequisites:

Recommended prerequisites:
1. Introduction to bioinorganic chemistry: Evolution of life on Earth from the point of view of inorganic chemistry.
2. General considerations, abundance of elements in Nature and living organisms, consequences of changes in chemical composition of Earth´s crust at earlier stages of evolution of life.
3. Biological functions of inorganic components in living systems. Coordination of metals to biological ligands.
4. Oxygen: uptake, transport, and storage.
5. Hemoproteins, peroxidases, catalases.
6. Iron: uptake, transport, and storage. Fe-S centers.
7. Biominerals.
8. Bioinorganic chemistry of copper. Bioinorganic chemistry of zinc. Toxicity of inorganic compounds.
9. Bioinorganic chemistry of molybdenum, vanadium, tungsten. Polyoxometalates.
10. Bioorganometallic chemistry. Medicinal chemistry and applications of coordination compounds
in bioinorganic chemistry: from cis-platin to anti-HIV drugs and beyond. Artificial metalloenzymes.
11. Nuclear medicine: Radioisotopes and their complexes in diagnostics and therapy.
12. Advanced bioinorganic chemistry: inorganic photosynthesis, protein crystallography, geobiotechnology and other examples.
The seminars will be focused on discussions to the chosen topic of the seminar thesis (finding scientific information using databases, analysis and extraction of data, writing the thesis).

Course requirements:

The seminars are evaluated during the term in the form of a seminar work. It is possible to get the maximum of 25 points for the thesis that will be aimed at the bioinorganic chemistry of a chosen element or group of elements. The teacher announces the topics for the seminar work at the beginning of the term. The students are required to submit the thesis prior to the end of teaching period of the term.
The final evaluation will be done by a written exam, for which the maximum of 75 points will be available.
Grade scale: A 92-100%, B 84-92 %, C 76-84 %, D 68-76 %, E 60-68 %, Fx less than 60 %.

Learning outcomes:
The aim of the course is to familiarize students with basic concepts of modern bioinorganic chemistry of the elements focused mostly on coordination chemistry of transition metal ions. The subjects of the course are as follows: the roles of inorganic components in biological systems, evolution of life on Earth from the point of view of inorganic chemistry, functions of transition metal ions such as compositional and supportive ones, catalytic functions, capture and storage of important (micro)elements, reactivity of small molecules, toxicity. The aim of the seminars is to familiarize students with writing of a longer scientific text in English focused on the chosen topic according to the students´ interests.

Class syllabus:
1. Introduction to bioinorganic chemistry: Evolution of life on Earth from the point of view of inorganic chemistry.
2. General considerations, abundance of elements in Nature and living organisms, consequences of changes in chemical composition of Earth´s crust at earlier stages of evolution of life.
3. Biological functions of inorganic components in living systems. Coordination of metals to biological ligands.
4. Oxygen: uptake, transport, and storage.
5. Hemoproteins, peroxidases, catalases.
6. Iron: uptake, transport, and storage. Fe-S centers.
7. Biominerals.
8. Bioinorganic chemistry of copper. Bioinorganic chemistry of zinc. Toxicity of inorganic compounds.
9. Bioinorganic chemistry of molybdenum, vanadium, tungsten. Polyoxometalates.
10. Bioorganometallic chemistry. Medicinal chemistry and applications of coordination compounds in bioinorganic chemistry: from cis-platin to anti-HIV drugs and beyond. Artificial metalloenzymes.
11. Nuclear medicine: Radioisotopes and their complexes in diagnostics and therapy.
12. Advanced bioinorganic chemistry: inorganic photosynthesis, protein crystallography, geobiotechnology and other examples.
The seminars will be focused on discussions to the chosen topic of the seminar thesis (finding scientific information using databases, analysis and extraction of data, writing the thesis).

Recommended literature:
Wolfgang Kaim, Brigitte Schwederski, Axel Klein: Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life: An Introduction and Guide. Wiesbaden, Wiley 2013.
Dieter Rehder: Bioinorganic Chemistry. Oxford, Oxford Univ. Press 2014. ISBN: 9780199655199
Nils Metzler-Nolte, Ulrich Schatzschneider: Bioinorganic Chemistry: A Practical Course. Berlin, De Gruyter 2009.

Languages necessary to complete the course:
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: RNDr. Lukáš Krivosudský, PhD.

Last change: 31.03.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KEM/N-bENS-024/22	Biostatistics

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: full-time and/or distance learning
Number of contact hours: 52 hours
per week: 2 hours lecture (2L) + 2 hours practice (2P) per level/semester: 13 weeks

Number of credits: 5

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Grades will be based on the one partial test done during the semester (contributing 20%) and the final exam test (contributing 80%). The course has a standardized grading system which is identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem- solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course.
D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
This course covers the background and skills needed to understand and apply modern statistical methods in environmental studies, biology, and other biology-related areas. By the end of this course students should be able to:
· Articulate a general understanding of basic statistical methods that are most often using in environmental and biological literature.
· Understand the principles of descriptive statistics and all the major numeric and graphic tools used for displaying environmental and biological data.
· Understand the principles of probability (incl. probability distributions), regression analysis, analysis of variance, understand the concept of drawing random samples from different populations, as well as the concept of hypothesis testing.

Understand the skills, knowledge, experience, and preparation needed to work effectively with the major modern statistical tools (incl. multidimensional statistical analyses) in environmental and biological research.

Class syllabus:
The lectures represent very intensive introductory course in statistical methods used in applied research. The purpose of the course is to familiarize students with the most common statistical methods used in environmental studies, biology, and other related areas. It should develop all the skills needed for effective data management, data manipulation and data analysis at a basic level. During the course, students should acquire all basic skills in the use of different statistical packages through classroom demonstrations and independent lab assignments. The course will emphasize data definition and verification, principles of statistical reasoning, graphical presentation, and careful interpretations of results. Topics such as descriptive statistics, graphical displays of data, introduction to probability, expectations and variance of random variables, confidence intervals and tests for means, differences of means, proportions, chi-square tests for categorical variables, regression, and multiple regression will be covered.

Recommended literature:
Lectures will be available to students in the form of PDF files in the e-learning environment Moodle (https://moodle.uniba.sk/?lang=en_us). At the same time, they will have access to other (including voluntary) literature, articles, videos, examples, and interesting websites.
Field, A. (2009): Discovering Statistics Using SPSS (and sex and drugs and rock ‘n’ roll). London: SAGE Publications, 3rd edition, 821 pp. https://www.nhm.uio.no/english/research/infrastructure/past/ (free statistical software for analyses, graphs, etc., with manual) https://www.qtiplot.com/ (free limited statistical software for analyses, graphs, etc., with manual)
Other relevant and useful (voluntary) literature:
Arora, P.N., Malhan, P.K. (2010): Biostatistics. Mumbai: Himalaya Publishing House, India, 555 pp. (available by remote access from Comenius University)
Rosner, B. 2016: Fundamentals of Biostatistics. Boston: Cengage Learning, USA, 962 pp.
Motulsky, H. 2018: Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking. New York: Oxford University Press, USA, 568 pp. (available at internet, 31.12.2021)
Kaps, M., Lamberson, W.R. (2004): Biostatistics for Animal Science: An Introductory Text. CABI Publishing, UK, 445 pp. (available at: https://www.academia.edu/8705674/Biostatistics_for_Animal_Science, 31.12.2021)

Languages necessary to complete the course:
English

Notes:
no

Past grade distribution
Total number of evaluated students: 28

A	B	C	D	E	FX
64,29	21,43	3,57	0,0	7,14	3,57

Lecturers: doc. RNDr. Marianna Molnárová, PhD.

Last change: 24.03.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-016/22	Biotechnology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: lecture
Number of hours:
per week: 2 per level/semester: 26
Form of the course: on-site learning / online

Number of credits: 3

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Grades will be based on a final written examination, which will consist of two areas – each 100% (see Learning Outcomes section). At least 50% will need to be obtained from each area. The final grade will be the average of the evaluation of both parts: A (92 – 100%) B (84 – 91 %) C (76 –83) D (68 –75%) E (60 – 67%) Fx (under 60%)

Learning outcomes:
After the course, students should understand basic principles of biotechnology and its impact on society in general and be able to orientate in the field of biotechnology information and be able to accumulate and transform the information into logical outputs in the form of presentation. An acquired knowledge will be in two areas:
1. Biopharmaceutical production and corresponding legislation: • Legislative framework of pharmaceutical biotechnology and process of drug registration in Europe and USA.
• Production process of biopharmaceuticals and required technological and non-technological necessities for production.; Fundamental organisms used for production of biopharmaceuticals and employed expression systems.
2. Basic potential application of classical and modern biotechnology in solving of environmental and food problems and perspectives of modern biotechnology in the fields.

Class syllabus:
Introduction to biotechnology, definition of the terms, development of biopharmaceuticals, preclinical and clinical trials and protection of the data thereof, registration process of drugs in USA and Europe and essential collection of the documents associated with it, ethic committee, good manufacturing practice, European directorate for the quality of medicines and healthcare and pharmacopoeia, and protection of intellectual property rights. Production process of biopharmaceuticals, down-stream and up-stream processes, product quality control, stabilization

of biopharmaceuticals and drug formulation, stability testing, standards for injection water, clean room categories and endotoxins, process waste and its disposal. Production organisms and expression system thereof, basic features of expression systems from bacteria to transgenic animals. Examples of important biopharmaceuticals produced by selected production organisms: interferons, interleukins, tumor necrosis factors, hematopoietic growth factors, growth factors, hormones, blood product, enzymes, antibodies, vaccines and adjuvants. Basics in environmental biotechnology, bioprospecting, bioremediation, biosensors, biotechnology in waste disposal, biodegradable plastics produced by microorganismsBasics in food biotechnology, genetically modified organisms in food biotechnology, single cell protein.

Recommended literature:

Groves M. J., 2006: Pharmaceutical biotechnology-second edition, CRC press, 396 pp.
Smith J. E., 2009: Biotechnology,Cambridge university press, 280 pp.
Walsh, G.., 2007: Pharmaceutical biotechnology. John Wiley and Sons Ltd, 465 pp.
Demain A. L., Davies J. E., 1999: Manual of industrial microbiology and biotechnology, American society for microbiology, 830 pp.
Friedman Y. 2006: Building Biotechnology, Thinkbiotech, 306 pp.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 7

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

Lecturers: prof. RNDr. Anton Horváth, CSc., doc. RNDr. Ján Krahulec, PhD.

Last change: 30.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFR/N-bBCH-004/22	Cell Biology

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lectures and laboratory courses
Number of contact hours: 52
per week: 2 hours lectures + 2 lab courses per level/semester: 26/26
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
Practice - during the semester students will be evaluated on the basis of laboratory protocols, oral or written exams, lesson´s activity. Students who obtain at least 60% points can go to the final exam. Lecture - the final written examination. The final evaluation includes: (0.9 x% of the final exam) + (0.1 x% of the practice) = final %. A: 100% - 92%, B: 91% - 84%, C: 83% - 76%, D: 75% - 68%, E: 67% - 60%. The evaluation Fx will be awarded to a student who receives less than 60%.

Learning outcomes:
Students completing the course will gain knowledge of the structure, physiology, metabolism and cell function, the complete cell ontogeny - from creation through differentiation to their death. Students acquire the knowledge and skills in cultivation, processing, observation and analysis of cells that should be utilized after graduation practice in research, scientific research or clinical trials.

Class syllabus:
Definition of various cell types and their onthogenesis. Methods and techniques of cell investigation. Cell walls, plasmatic membrane, cytoskeleton. Endo-membrane cell system. Plastids and mitochondrion. Vacuoles, lysosomes, microbodies. Nucleus and cell cycle. Functional and morphological differentiation of animal cells and their cultivation. Mechanisms of differentiation, dedifferentiation, and regeneration of specific animal cell types. Cellular and non-cellular structures in microbiology. Functional and morphological differentiation of Protista cells. Eukaryotic cell as an integrative system of genetic compartments, its origin and evolution. Basic principles of cell signalling.

Recommended literature:
Lodish H., Berk A., Krieger M., Bretscher A., Amon A., Scott M.P. 2012. Molecular Cell Biology. 7th edition, ISBN-10: 142923413X

ISBN-13: 978-1429234139
Pollard T.D., Earnshaw W.C., Lippincott-Schwartz J. 2007. Cell Biology. 2nd Edition. ISBN-10: 1416022554
ISBN-13: 978-1416022558
Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. 2007. Molecular Biology of the Cell. 5th Edition. ISBN-10: 0815341059
ISBN-13: 978-0815341055
Karp G. 2009. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. ISBN-10: 0470483377
ISBN-13: 978-0470483374
Vesteg M., Krajčovič J. 2011. The falsifiability of the models for the origin of eukaryotes. Current Genetics 57: 367-390.

Languages necessary to complete the course:
English

Notes:
The course will be held in winter semester only.

Past grade distribution
Total number of evaluated students: 30

A	B	C	D	E	FX
13,33	13,33	23,33	16,67	16,67	16,67

Lecturers: doc. Mgr. Michal Martinka, PhD., prof. RNDr. Helena Bujdáková, CSc., prof. Mgr. Iveta Herichová, PhD., doc. Mgr. Ľuboš Molčan, PhD., doc. RNDr. Martin Mrva, PhD.

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFTCh/N-bBCH-045/22	Chemical Modeling

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 1 **per level/semester:** 14 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
1 h lecture, 1 h practical - computer lab per week
Number of contact hours:
per week: 1 / 1 per level/semester: 13 / 13
on-site learning

Number of credits: 3

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
Laboratory work will be graded as follows: 70% presence at modeling interactive task, 30% seminary
essay. Only those students will be admitted who achieved at least 60 % of the points from interactive task evaluation. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points. Credits will not be assigned to a student, who will not earn at least 60% from interactive task.

Learning outcomes:
This course covers the background of theoretical chemistry. Students will have:
• Basic skills in using operating system Unix/Linux
• Skills to use molecular rendering and modeling basics.
• Knowledge of molecular mechanics and its applications.
• Skills in using basic computational chemistry methods (program Gaussian).
• Skills to work with graphical utilities and different graphical formats (Molden, Avogadro)

Class syllabus:
1. Introduction to operating systems (Linux, Windows), user environment (shell), commands, scripts
2. Basic concepts a principles (definition of molecular model, coordinates systems, Z-matrix, approximate methods of modeling, force fields)
3. Conformation analysis in molecules, capabilities and limits of MM method)
4. Ab initio methods, molecular orbitals and properties.
5. Graphical analysis of MO calculations (construction of Z-matrix, identification of orbitals, densities)
6. Introduction to advanced ab initio methods (geometry optimization, IR spectra)

7. Calculation of thermodynamic properties – enthalpy, Gibbs free energy.
8. Chemical reactivity, potential energy surface, minima and transition states.
9. ESP (electrostatic potential surfaces), identification of nucleophilic/electrophilic sites.
10. Excited states - calculation of UV-VIS spectra.

Recommended literature:

R. Cramer, Computational Chemistry, Wiley, 2004.
• T. Heine, J-O. Joswig, A. Gelessus, Computational Chemistry Workbook, Wiley, Weinheim, 2009.
• A. Leach, Molecular Modelling: Principles and Applications, Prentice Hall, 2001.
• F. Jensen, Introduction to Computational Chemistry, Wiley, 2007
• V. Lukeš a kol., Počítačové modelovanie molekúl, STU Bratislava, 2011

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 4

A	B	C	D	E	FX
25,0	25,0	25,0	25,0	0,0	0,0

Lecturers: prof. RNDr. Ivan Černušák, DrSc., doc. Mgr. Michal Pitoňák, PhD., prof. Mgr. Radovan Šebesta, DrSc., Ing. Michal Májek, PhD.

Last change: 17.10.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KBCh/N-bOBH-101/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
Course requirements: State Examination.	
Learning outcomes: State Examination	
Class syllabus: Defence of the Bachelor thesis. Requirements of the Department where the defense takes place.	
State exam syllabus:	
Recommended literature: Depending on the Department where the defense takes place	
Languages necessary to complete the course: English	
Last change: 27.07.2022	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KFR/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KŽFE/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KMV/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KMB/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KGe/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KOrCh/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KJCh/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KAgCh/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KAlCh/N-bOBH-102/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Natural Sciences	
Course ID: PriF.KFTCh/N-bOBH-103/22	**Course title:** Defence of Bachelor Thesis
Number of credits: 8	
Educational level: I.	
State exam syllabus:	
Last change:	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-132/22	ESP 1/English for Specific Purposes

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 355

A	B	C	D	E	FX
70,14	16,06	6,48	1,97	1,97	3,38

Lecturers: PhDr. Štefánia Dugovičová, PhD., Mgr. Lenka Jeleňová, Mgr. Barbara Kordíková, PhD., PaedDr. Stanislav Kováč, PhD., PhDr. Oľga Pažitková, CSc., RNDr. Tatiana Slováková, PhD., Mgr. Simona Tomášková, PhD.

Last change: 26.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-133/22	ESP 2/English for Specific Purposes

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 234

A	B	C	D	E	FX
83,76	11,54	2,14	0,85	0,43	1,28

Lecturers: PhDr. Štefánia Dugovičová, PhD., Mgr. Lenka Jeleňová, Mgr. Barbara Kordíková, PhD., PaedDr. Stanislav Kováč, PhD., PhDr. Oľga Pažitková, CSc., RNDr. Tatiana Slováková, PhD., Mgr. Simona Tomášková, PhD.

Last change: 26.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-134/22	ESP 3/English for Specific Purposes

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 288

A	B	C	D	E	FX
81,6	12,15	2,43	0,0	1,04	2,78

Lecturers: PhDr. Štefánia Dugovičová, PhD., Mgr. Lenka Jeleňová, Mgr. Barbara Kordíková, PhD., PaedDr. Stanislav Kováč, PhD., PhDr. Oľga Pažitková, CSc., RNDr. Tatiana Slováková, PhD.

Last change: 26.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-135/22	ESP 4/English for Specific Purposes

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 194

A	B	C	D	E	FX
85,05	9,28	3,61	0,52	0,52	1,03

Lecturers: PhDr. Štefánia Dugovičová, PhD., Mgr. Lenka Jeleňová, Mgr. Barbara Kordíková, PhD., PaedDr. Stanislav Kováč, PhD., PhDr. Oľga Pažitková, CSc., RNDr. Tatiana Slováková, PhD.

Last change: 26.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-136/22	Fachdeutsch in Naturwissenschaften 1

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 15

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

Lecturers: Mgr. Karin Rózsová Wolfová

Last change: 23.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-137/22	Fachdeutsch in Naturwissenschaften 2

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

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: Mgr. Karin Rózsová Wolfová

Last change: 23.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAgCh/N-bBCH-002/22	General and Inorganic Chemistry

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 5 / 4 **per level/semester:** 70 / 56
Form of the course: on-site learning

Number of credits: 9

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
Laboratory exercises:
The evaluation will consist of two parts: reports from laboratory experiments, 4 points each (40 points maximum), and final written examination focused on the chemical principles of the performed syntheses (10 points). Only those students will be admitted to final examination who achieve at least 50 % of the points from laboratory work evaluation.
Lectures:
Final exam will consist of a 30-point test and oral examination for 20 points. Credits will not be assigned to a student, who will not earn at least 50% from laboratory work, and to student, who will not earn at least 50 % from final exam.
For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points.

Learning outcomes:
This course covers the background and skills needed to understand the basic principles of chemistry. By the end of this course students should be:
• Able to understand the electronic structure of atoms, and acquires the basic knowledge on chemical bonding.
• Able to understand the molecular properties and the bulk properties of the matter. Basic principles in thermodynamics, chemical kinetics, chemical equilibrium, acid-base theories, and diverse types of chemical reactions.
• Able to understand basic properties of inorganic compounds of elements along all the groups of the periodic table.
• Skilled in basic nomenclature of inorganic compounds. Inherent to the course is training in solutions of chemical equations.
• Able to perform the basic laboratory experiments in the course of solving simple tasks related to the learned topic. Students will gain experience in basic laboratory techniques, synthesis of inorganic compounds and coordination compounds.

Class syllabus:
Lectures:

Composition of the matter; chemical reactions, formulae and equations; fundamental empirical laws; atomic structure; molecular structure – models of chemical bonding; Lewis theory; hybridization and valence bond theory; molecular orbital theory; bond polarity; electronegativity; oxidation number; ionic bond; hydrogen-bonding; van der Waals interactions. Principles of thermodynamics: Equation of state; state functions; internal energy; enthalpy; entropy; laws of thermodynamics; thermochemical laws; spontaneous processes; states of the matter; phase – phase transitions; disperse systems – mixtures, solutions; Raoult law – colligative properties. Solid state – structures. The principles of chemical kinetics: reaction rate and order; mechanism; catalysis; chemical equilibrium.
Electrolytic dissociation; acid-base theories; neutralization; pH; hydrolysis. Precipitation reactions; the solubility product. Photochemical and radical reactions. Oxidation and reduction.
Elements and their basic compounds: hydrogen; group 1-2 and group 13-18 elements; d-block elements; coordination bonding; basic stereochemistry; magnetic properties; organometallic compounds, basic biological functions of inorganic components.
Laboratory exercises:
Safety in a chemical laboratory. Basic laboratory glassware and operations. Laboratory experiments focused on: density, solubility, preparing solutions, crystallization, affecting chemical reactions, hydrolysis, oxidation and reduction reactions, synthesis of compounds and metals by redox reactions, heterogeneous reactions, proof reactions of inorganic cations and anions, synthesis of acids and basis, neutralization, amphoterism, coordination compounds.

Recommended literature:
Duward Shriver, Peter Atkins: Inorganic Chemistry, 5th edition, 2010, Oxford University Press
Stephen Lower: Chem1 virtual textbook a reference text for General Chemistry
http://www.chem1.com/acad/webtext/virtualtextbook.html

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
13,79	20,69	10,34	20,69	24,14	10,34

Lecturers: prof. RNDr. Jozef Noga, DrSc., Mgr. Peter Hrobárik, PhD., RNDr. Lukáš Krivosudský, PhD.

Last change: 04.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KGe/N-bBCH-010/22	Genetics

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 4 **per level/semester:** 28 / 56
Form of the course: on-site learning

Number of credits: 7

Recommended semester: 3.

Educational level: I.

Prerequisites:

Recommended prerequisites:
none

Course requirements:
Grades will be based on (1) preliminary examinations at practicals during the semester (20% of the final mark) and (2) the final test covering the entire syllabus (80%). The course has a standardized grading system which is identified below:
A (92 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (85–91 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (77–84%): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (77–84%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60–68%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Students will acquire a knowledge in classical genetics, cytogenetics, molecular basis of heredity, mechanisms involved in mutagenesis,
population and quantitative genetics, genetic basis of cancer and development, extrachromosomal inheritance and contemporary whole genome analyses and their implications for evolutionary biology and medicine.

Class syllabus:
Lectures will cover the following areas of genetics:
Genetics as a biological discipline - Chromosome basis of inheritance - Mendelian inheritance - Genetic determination of sex - Deviations from mendelian inheritance - Linkage of genes and genetic recombination - Chromosomal aberations and their evolutionary and clinical implications

- DNA structure and mechanism of replication - Anatomy and function of a gene - Mutations as a source of genetic variability - Gene expression I: Flow of genetic information from DNA to RNA - Gene expression II: Flow of genetic information from RNA to proteins - Gene expression III: Regulatory mechanisms in prokaryotes and eukaryotes - Methods in molecular genetics - Genetic analysis of prokaryotes - Population genetics - Inheritance of quantitative traits - Extrachromosomal inheritance - Genetic analysis of eukaryotic cell cycle and its implications for cancer - Genetic analysis of animal development - Comparative and evolutionary genomics.

Recommended literature:

Snustadt, D.P., Simmons, M.J. (2011). Principles of genetics. John Wiley and Sons; 6th edition.
Hartwell, L.H., Hood, L., Goldberg, M.L., Reynolds, A.E., Silver, L.M., Veres, R.C. (2008). Genetics: From Genes to Genomes. 3rd Edition. McGraw-Hill, International Edition.
Russell, P.J. (2006). iGenetics: A Molecular Approach. 2nd Edition. Pearson/Benjamin Cummings. International Edition.

Languages necessary to complete the course:

English

Notes:

Students' participation in practicals is obligatory

Past grade distribution

Total number of evaluated students: 23

A	B	C	D	E	FX
8,7	8,7	13,04	17,39	26,09	26,09

Lecturers: prof. RNDr. Andrea Ševčovičová, PhD., doc. Mgr. Miroslava Slaninová, Dr., prof. RNDr. Ľubomír Tomáška, DrSc., doc. RNDr. Eliška Gálová, PhD., RNDr. Regina Sepšiová, PhD., Mgr. Katarína Gaplovská, PhD., Mgr. Lucia Mentelová, PhD., Mgr. Filip Brázdovič, PhD.

Last change: 22.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KGe/N-XXXX-004/21	Genetics for everyone

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I., 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: 1090

A	B	C	D	E	FX
92,84	0,92	0,0	0,0	0,0	6,24

Lecturers: RNDr. Regina Sepšiová, PhD., doc. Mgr. Miroslava Slaninová, Dr., Mgr. Filip Červenák, PhD., prof. RNDr. Andrea Ševčovičová, PhD., doc. RNDr. Eliška Gálová, PhD., Mgr. Stanislav Kyzek, PhD.

Last change: 15.05.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KRGRR/N-XXXX-001/21	Geography of the World in the 21.st century

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 1 / 1 **per level/semester:** 14 / 14
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I., 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: 88

A	B	C	D	E	FX
81,82	4,55	5,68	1,14	1,14	5,68

Lecturers: Mgr. Rastislav Cákoci, PhD., RNDr. Katarína Danielová, PhD., doc. RNDr. Daniel Gurňák, PhD., doc. RNDr. František Križan, PhD., doc. RNDr. Eva Rajčáková, CSc., Mgr. Michala Sládeková Madajová, PhD., RNDr. Angelika Švecová, PhD., Mgr. Martin Šveda, PhD., prof. RNDr. Ladislav Tolmáči, PhD., RNDr. Mgr. Anna Tolmáči, PhD., Mgr. Gabriel Zubriczký, PhD.

Last change: 15.05.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KGP/N-XXXX-007/21	Geology in Nutshell

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 2 **per level/semester:** 14 / 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I., 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: 44

A	B	C	D	E	FX
86,36	0,0	0,0	0,0	11,36	2,27

Lecturers: prof. RNDr. Roman Aubrecht, Dr., prof. Mgr. Natália Hlavatá Hudáčková, PhD., doc. RNDr. Jozef Hók, CSc., prof. RNDr. Michal Kováč, DrSc., RNDr. Alexander Lačný, PhD., doc. RNDr. Jana Fridrichová, PhD., RNDr. Ondrej Nemec, PhD.

Last change: 20.01.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KPl/N-XXXX-009/21	Global Environmental Issues

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I., 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: 555

A	B	C	D	E	FX
90,27	0,0	0,54	0,0	0,0	9,19

Lecturers: doc. RNDr. Katarína Pavličková, CSc., prof. RNDr. Pavel Dlapa, PhD., RNDr. Martina Zvaríková, PhD., doc. RNDr. Ľubomír Jurkovič, PhD.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KEM/N-bXXX-001/19	Green University 1

Educational activities:
Type of activities: practicals / seminar
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 2.., 3., 4.., 5., 6..

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 150

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

Lecturers: RNDr. Jaroslav Bella, doc. Mgr. Miroslava Slaninová, Dr., RNDr. Hubert Žarnovičan, PhD., Mgr. Martin Šebesta, PhD.

Last change: 11.02.2020

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KEM/N-bXXX-002/19	Green University 2

Educational activities:
Type of activities: practicals / seminar
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 2.., 3., 4.., 5., 6..

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 39

A	B	C	D	E	FX
87,18	0,0	0,0	0,0	0,0	12,82

Lecturers: RNDr. Jaroslav Bella, doc. Mgr. Miroslava Slaninová, Dr., Mgr. Martin Šebesta, PhD., RNDr. Hubert Žarnovičan, PhD.

Last change: 11.02.2020

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAn/N-bBCH-032/22	Human Biochemical and Genetic Variability

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 1 **per level/semester:** 14 / 14
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

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: RNDr. Veronika Candráková Čerňanová, PhD., doc. RNDr. Lenka Vorobeľová, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-028/22	Human Genetics

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 3 / 2 **per level/semester:** 42 / 28
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
40,0	26,67	20,0	0,0	13,33	0,0

Lecturers: doc. Mgr. Andrej Ficek, PhD., Mgr. Marián Baldovič, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMV/N-bBCH-015/22	Immunology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture
Number of contact hours:
per week: 2 per level/semester: 26

Number of credits: 3

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Subject ends with a written exam. The course has a standardized evaluating (grading) system: Grade A (100-92 %); B (91-84 %); C (83-76 %); D (75-68 %); E (67-60 %); FX (59-0 %).

Learning outcomes:
Immunology is one of the most dynamic disciplines that affect the clinical virology and microbiology. Lectures in immunology give students a basic understanding of the immune system, its anatomy, structure, and function in the human body. The aim of the lectures is also acquainted students with basic immunological processes occurring in the body during infection of various infectious pathogens.

Class syllabus:
The immune system. Cells of the immune system. Tissues and organs of the immune system. Cell adhesion molecules and leukocyte migration. Cytokines. Mediators of immune responses. Complement. Inflammation. Major histocompatibility complex molecules. Structure of immunoglobulins and T-cell receptors. Antigens and their recognition. Cellular immune responses. Cooperation cells in antibody formation. Regulation of immune responses, immune tolerance. Immune system and microorganisms. Immune defence against viruses, bacteria, fungi, protozoa and parasitic worms. Immunoprophylaxis. Vaccination. Antitumor immunity. Immunopathological processes. Hypersensitivity reactions (type I to V). Autoimmunity. Overview of autoimmune diseases. Basic characteristics of immunodeficiencies. Primary and secondary immunodeficiencies.

Recommended literature:
Male, D. et al. (2021) Immunology, 9th edn AP Elsevier, ISBN: 978-0-7020-7844-6.
Punt, J. et al. (2019) Kuby Immunology, 8th edn, Macmillan, ISBN: 978-1-319-11470-1;
Abbas, A.K. et al. (2016): Basic Immunology, 5th edition, AP Elsevier, ISBN: 978-0-323-39082-8.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
37,5	18,75	18,75	6,25	6,25	12,5

Lecturers: doc. RNDr. Tatiana Betáková, DrSc., doc. RNDr. Miroslava Šupolíková, PhD.

Last change: 12.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAlCh/N-bBCH-036/22	Introduction to Bioanalysis

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 1 / 1 **per level/semester:** 14 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Number of contact hours:
per week: 1 /1 per level/semester: 13 / 13
on-site learning, on-line learning

Number of credits: 2

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
Seminar – a maximum of 40 points, for elaboration and presentation of a seminar paper. Lecture – a maximum of 60 points, for the final test. The final grade will consist of evaluation of seminar and the final test from lecture, for a maximum of 100 points. For grade A it is necessary to obtain at least 92 points, for grade B at least 84 points, for grade C at least 76 points, for grade D at least 68 points and for grade E at least 60 points. The evaluation is the same for on-line learning.

Learning outcomes:
Students will get acquainted with the current state of bioanalytical chemistry and with sampling techniques and methods of processing biological samples. The course is also suitable for students of biochemistry or biology who are interested in analytical techniques aimed at investigation of wide range of biomolecules, e.g., hormones, amino acids, peptides, proteins, nucleic acids, carbohydrates, etc. The topic of this course supports interdisciplinary character of bioanalysis through education in electrophoresis, liquid chromatography, biosensors, bioassays, DNA and proteins sequencing, combination of PCR and analytical methods. The content of the objective is complementary to the knowledge that is usually not involved in common textbooks on analytical chemistry. Students will co-solve the problems of case studies in the field of biochemistry, biotechnology, and the other natural sciences.

Class syllabus:
• Definition of field of interest, problems, strategies, procedures, methods, applications and the state-of-the-art of bioanalysis in the science system of analytical chemistry.
• Biologically distinct molecules and the need for their determination in biological samples.
• Specific properties and characteristics of biological samples (microbiological, biotechnological, plant, animal, food), sample stability and source of errors, sampling rules, storage, processing, and pretreatment before measurement.
• Clinical samples – blood, serum, plasma, urine, saliva, cerebrospinal fluid, tissues.

• Diagnostic and clinical analysis. Use of biochemical and biological principles for the purpose of chemical analysis of selected substances (e. g., measurement of pH of body fluids, cytometry, cell sorting).
• Specific requirements for bioanalysis instrumentation.
• Solid phase extraction in bioanalysis, biochromatography, denaturing chromatography, electroseparation methods. Specific requirements due to the nature of the biological samples and the limitations of their analysis.
• Bioanalysis in genomics. Relationship between bioseparation methods and PCR.
• Bioanalysis in proteomics. Protein sequencing. Problems of validation in bioanalysis of biomacromolecules.
• Chemical analysis of metabolites - metabolomics, metabolonomics. Criteria for data processing and results interpretation in bioanalysis. Biological samples variability.
• Trends in development of analytical instrumentation and equipment. Biocompatibility of materials used in instrumentation.

Recommended literature:

A. Manz, N. Pamme, D. Iossifidi, Bioanalytical Chemistry, Imperial College Press, 2004.
G. Evans (ed.) A Handbook of Bioanalysis and Drug Metabolism, CRC Press 2004.
K. Mitchelson, New High Throughput Technologies for DNA Sequencing and Genomics, Elsevier, 2007.
R. F. Venn, Principles and Practice of Bioanalysis, CRC Press, 2003.
Scientific journals - Analytical and Bioanalytical Chemistry, Journal of Bioanalysis and Biomedicine, Bioseparation, Journal Chromatography B, Journal of Separation Science, Electrophoresis, etc.

Languages necessary to complete the course:
English

Notes:
The course is provided only in the winter semester. If less than 3 students enroll, the course will be provided in individual form.

Past grade distribution
Total number of evaluated students: 13

A	B	C	D	E	FX
7,69	76,92	15,38	0,0	0,0	0,0

Lecturers: prof. RNDr. Marian Masár, PhD., Ing. Roman Szücs, PhD., Mgr. Jasna Hradski, PhD.

Last change: 28.03.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJCh/N-bBCH-041/21	Introduction to Radiobiology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I.

Prerequisites:

Course requirements:
The applicant successful graduation of the course is to obtain minimally 50 % of points of the final examination: seminar work (50%) + examination (50%). For the grade A (excellent) it is necessary to obtain at least 92–100%, to obtain the grade B (very good) at least 84–91%, for the grade C (good) at least 76–83%, for the grade D (satisfactory) at least 68– 75% and for E rating (adequate) at least 60–67%. A rating below 60% is rated as FX (insufficient).

Learning outcomes:
Course covers the physical and chemical basics of radiobiology, cell- organism interaction with radiation and radiation damage repair, the applications of ionizing and non-ionizing radiation in medicine. Within the frame of the course is the visit of workplace focused on radiobiology. Students who enroll in this course can benefit from the following: physical basics of radiobiology, mechanisms of effects of ionizing radiation on living organisms and cell repair mechanisms, radiation-caused diseases and therapy, radiation syndromes, protection of the organisms against radiation damage, the usage of ionizing and non-ionizing radiation in medicine, the effects of solar UV radiation and protection.

Class syllabus:
1. The subject and historical overview of radiobiology, radiation sensitivity of biological species. 2. Physical basics of radiobiology, quantities and terminology. 3. DNA- and cell damage produced by ionizing radiation, biological effect vs. dose curves. 4. Modification of cell damage by radiation, radioprotectors and radiation sensitivity. 5. Repair of cell damage induced by radiation. 6. Molecular radiation biology and biochemistry, the effect of ionizing radiation on metabolism. 7. Radiation syndroms (sickness) and their modulation: bone marrow syndrom, gastrointestinal syndrom, central nervous system syndrom. 8. Radiation sicknesses: acute and chronic cases, their classification, development, diagnosis, therapy. 9. Radiation induced tissue damage, radiation effect on embryo and fetus. 10. Radiation application and incorporated radionuclides in medicíne. Radiotherapy - external and internal. 11. Theoretical conception of mechanisms involved in ionizing radiation systemic effects. 12. After-effects of ionizing radiation: somatic and genetic, limit doses, ALARA, radiation-induced cancer, risk factors, dose response.

Recommended literature:

•Podgorsak E.B.: Radiation Oncology Physics: A Handbook for Teachers and Students. Vienna, IAEA Publication, 2005. ISBN: 92-0-107304-6. •Pöschl, M., Nollet, L.: Radionuclide Concentrations in Food and the Environment. Boca Raton - London - New York : CRC Press, Taylor & Francis Group, 2007. ISBN 0-8493-3594-9. •Bailey D.L., Humm J.L., Todd-Pokropek A., van Aswegen A.: Radiation Medicine Physics: A Handbook for Teachers and Students. Vienna, IAEA Publication, 2014. ISBN: 978-92-0-143810-2.

Languages necessary to complete the course:

Notes:

Past grade distribution

Total number of evaluated students: 10

A	B	C	D	E	FX
60,0	0,0	0,0	10,0	10,0	20,0

Lecturers: Ing. Darina Tóthová, CSc.

Last change: 30.03.2023

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJCh/N-bBCH-040/21	Introduction to Radiochemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I.

Prerequisites:

Course requirements:
The applicant successful graduation of the course is to obtain minimally 60 % of points of the final examination: seminar work (50%) + examination (50%). For the grade A (excellent) it is necessary to obtain at least 92–100%, to obtain the grade B (very good) at least 84–91%, for the grade C (good) at least 76–83%, for the grade D (satisfactory) at least 68– 75% and for E rating (adequate) at least 60–67%. A rating below 60% is rated as FX (insufficient).

Learning outcomes:
Radiochemistry or nuclear chemistry is the study of radiation from an atomic and molecular perspective, including elemental transformation and reaction effects, as well as physical, health and medical properties. Based on this students how to use radioactivity as a tool for chemically related research and related fields (for example material science, biochemistry, and medicine). The course teaches students fundamental radiochemical methods for qualitative and quantitative analysis of radionuclides in various media. The principles for the detection of radioactive radiation and material will be thoroughly covered.

Class syllabus:
1.-2. Nuclear chemistry fundamentals: nuclear decay, nuclear properties, and kinetics of nuclear decay. 3. Interaction with matter. 4.-5. Production of radionuclides. 6. Nuclear reactions and nuclear fission. 7. Nuclear Analytical Techniques. 8. Detection of radiation and measurement techniques. 9. Radiation therapy. 10. Radiotracers. 11. Radiochemical separation techniques. 12.-13. Nuclear energy – nuclear power plants, nuclear fuel cycle, nuclear wastes.

Recommended literature:
•Walter D. Loveland, David J. Morrissey, Glenn T. Seaborg (2006). Modern Nuclear Chemistry. John Wiley & Sons, Inc. ISBN:9780471115328. •József Kónya, Noémi M. Nagy (2012). Nuclear and Radiochemistry. ELSEVIER. ISBN 978-0-12-391430-9. DOI https://doi.org/10.1016/C2011-0-06943-0 •Gregory Choppin (2013) Radiochemistry and Nuclear Chemistry. Elsevier Books. EAN: 9780124058972.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 10

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

Lecturers: Ing. Helena Švajdlenková, PhD.

Last change: 13.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJCh/N-bENS-053/21	Introduction to Radioecology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 2., 4., 6.

Educational level: I.

Prerequisites:

Course requirements:
The applicant successful graduation of the course is to obtain minimally 60 % of points of the final examination: seminar work (50%) + examination (50%). For the grade A (excellent) it is necessary to obtain at least 92–100%, to obtain the grade B (very good) at least 84–91%, for the grade C (good) at least 76–83%, for the grade D (satisfactory) at least 68– 75% and for E rating (adequate) at least 60–67%. A rating below 60% is rated as FX (insufficient).

Learning outcomes:
The student will acquire the knowledge about the origin and sources of ecologically important radionuclides, which are found in various segments of the environment. Radionuclides migration between individual segments, as well as their elimination. A general view about population radiation exposure the from primordial radionuclides to the nuclear facilities operation and events at facilities. The output is also a basic overview of the minimum legal literacy in the field of peaceful use of nuclear energy.

Class syllabus:
1. Radiation. 2. Human and environment. 3.-4. Radionuclides and their chemistry 5. Dosimetry. 6.7. Distribution of radioactive substances in environment. 8. Effects of radiation and population dosage. 9. Nuclear industry and environment. 10. Processing, disposal, and storage of radioactive waste from an environmental point of view. 11. Nuclear facilities accidents. 12. Radiation accidents, nuclear bombing, and nuclear weapons tests. 13. Radiation protection.

Recommended literature:
•Sparks, L. D., Environmental Soil Chemistry, ACADEMIC PRESS, Delaware, 2003, ISBN: 0-12-656446-9. •Holm, E. Radioecology. LUND UNIVERSITY, Lund, Sweden, 1994, ISBN: 978-981-4534-28-4. • IAEA., The Atom, Environment and Sustainable Development •IAEA., Country nuclear power profiles-Slovakia. •IAEA [online publications] https://www.iaea.org/publications.

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: doc. RNDr. Eva Viglašová, PhD.

Last change: 13.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-040/22	Introductory Seminar in Organic Chemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: seminar
Number of contact hours: 2 h of seminars
per week: 2 per level/semester: 26

Number of credits: 2

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
Course will be evaluated by a written test. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points. Credits will not be assigned to a student, who will not earn at least 60% of points in the test.

Learning outcomes:
This course aims to streghthen understanding of basics concepts in organic chemistry via individual students work on the seminars, were assignements on topic from the organic chemistry lecture will be discussed. This seminar aims to provide additional training in core organic chemistry topics and thus help understand important concepts from lecture Organic Chemistry. By the end of this course students should be able to understand basic properties of common organic compounds, understand mechanisms of typical organic reactions.

Class syllabus:
Introduction to organic chemistry - nomenclature of organic compounds, bonding in organic compounds, basic principles of stereochemistry, electronic effects, acido-basic properties of organic compounds). Properties and and typical reactions (both syntheses of specific compounds as well as their reactions) of major classes of organic compounds: alkanes, alkenes, alkynes and dienes; aromatic hydrocarbons; organic halogen derivatives; organometallic compounds; alcohols, tiols and phenols, ethers, epoxides and sulfides; nitrogen containing compounds – nitrocompounds and amines; carbonyl compounds – aldehydes, ketones, saccharides; carboxylic acids and their functional derivatives, such as acyl halogenides, esters, amides, anhydrides; amino acids, peptides, proteins, lipids; heterocyclic compounds, nucleic acids. Basics of multistep organic synthesis will practiced on seminars too. Attention will be also devoted to basic applications of spectroscopy techniques, mainly 1H NMR.

Recommended literature:
J. McMurry, Organic Chemistry, Cengage Learning, 2009. J. Clayden, N. Greeves, S. Warren, Organic
Chemistry, Oxford University Press, 2012.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 22

A	B	C	D	E	FX
27,27	13,64	9,09	9,09	27,27	13,64

Lecturers: Mgr. Ambroz Almássy, PhD.

Last change: 13.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-138/22	Latin

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 2..

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 285

A	B	C	D	E	FX
63,16	15,44	7,02	3,86	2,46	8,07

Lecturers: Mgr. Ivan Lábaj, PhD., RNDr. Tatiana Slováková, PhD.

Last change: 07.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJCh/N-bBCH-042/22	Legislation and Ethics

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:
0/100
Course will be evaluated by a written test in the exam period. For the grade A (excellent) it is necessary to obtain at least 92–100%, to obtain the grade B (very good) at least 84–91%, for the grade C (good) at least 76–83%, for the grade D (satisfactory) at least 68– 75% and for E rating (adequate) at least 60–67%. A rating below 60% is rated as FX (insufficient).

Learning outcomes:
Students become aware of legislative and normative aspects of chemistry with emphases of European legislation and international standards. After completing of course, they should know the legal regulations concerning the handling of hazardous chemicals, health and environmental risks of toxic and radioactive substances, genetically modified organisms. They should know the quality management systems of laboratory activities, systems assurance and quality control of chemicals, pharmaceuticals, and food.

Class syllabus:
· European legislation and international standards.
· Chemical safety and biosafety – chemical safety assessment, EU laws on chemicals (REACH and CLP regulations), chemical safety cards, the Cartagena Protocol on biosafety
· Intellectual property rights in life sciences.
· Toxicology – routes of entry of chemicals into the body, mechanism of action of toxic and very toxic substances on the body, the causes and symptoms of poisoning, biotransformation and excretion from the body
· Basic rules for working with genetically modified organisms (GMO). Requirements for equipment to work with GMOs I. and II. category
· Ethical issues in genetics.
· Radiation and safety – sources of radiation, biological effects of ionizing radiation, principles of radiation protection, application of the basic safety standards
· Principles of good practice (GLP) – definitions of terms, Quality Assurance and GLP, Compliance of Laboratory Suppliers with GLP principles, the application of the GLP principles to non-clinical studies

· Application of radioisotopes in biology, biochemistry and medicine
· Threat of terrorism – chemical, biological and nuclear weapons

Recommended literature:

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
0,0	42,86	42,86	14,29	0,0	0,0

Lecturers: doc. RNDr. Oľga Rosskopfová, PhD., doc. RNDr. Stanislav Stuchlík, PhD., prof. RNDr. Anton Horváth, CSc., doc. Mgr. Miroslava Slaninová, Dr.

Last change: 13.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KPl/N-XXXX-008/21	Man as a part of the nature

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., 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: 954

A	B	C	D	E	FX
90,04	0,1	0,0	0,0	0,1	9,75

Lecturers: RNDr. Martina Zvaríková, PhD., prof. RNDr. Pavel Dlapa, PhD., RNDr. Malvína Reiffers Čierniková, PhD., prof. RNDr. Elena Masarovičová, DrSc., prof. PaedDr. Pavol Prokop, DrSc., prof. RNDr. Peter Fedor, DrSc., prof. Ing. Eva Chmielewská, CSc., RNDr. Martin Labuda, PhD., doc. RNDr. Eva Pauditšová, PhD., RNDr. Hubert Žarnovičan, PhD., doc. RNDr. Stanislav Rapant, DrSc., doc. RNDr. Ľubomír Jurkovič, PhD., doc. Mgr. Tomáš Lánczos, PhD., doc. RNDr. Katarína Pavličková, CSc.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KIHG/N-bBCH-004/22	Mathematics 1

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 2 **per level/semester:** 14 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: internal study (presence/online/combined)
Number of contact hours: 2 hours lecture and 1 hour practical per week
per week: 3 per level/semester: 39

Number of credits: 4

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
Grading Policy (Assessment/Evaluation): Grades will be based on the final exam test (contributing 100%). During the term students have to complete problems solutions, which will be defined in the frame of exercises and only those, who will finish all of these problems solutions will be accepted for the final examination. The course has a standardized grading system which is identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Aims and Objectives:
This course covers selected topics from the basic theoretical background of mathematical analysis methods, used in the processing and interpretation of natural sciences experiments/datasets.

Class syllabus:
Syllabus/Indicative Content:
Basic concepts of algebra (statements, theorems, proofs), elementary sets and their properties. Algebra of complex numbers. Fundamentals of linear algebra, matrices and their properties, basic matrix operations; determinant; systems of linear equations and methods of their solution (Gauss

elimination method, Cramer's rule). Elements of vector algebra, basic operations with vectors. Real functions of a real variable, elementary functions and their properties (graphs), inverse functions. Equalities and inequalities. Limit of the sequences and functions, basic rules for limits evaluation, continuity property of a function. Finite and infinite series. Derivative of real function of one variable – the definition, geometric significance, basic theorems; derivative of elementary function; derivatives of higher orders; differential of function and its practical use; Taylor's series; the theorem on average value; L'Hôpital's rule. The course of a function – monotonous, convex, and concave functions, stationary and inflection points, local extremes, asymptotes. Indefinite integral, the primitive function - definition, methods of integration – integration by parts (per partes) and substitution method, integration of some rational functions, partial fractions decomposition. The concept of definite integral and its base properties; Newton-Leibniz formula; some applications and examples of definite integral – lengths of curve, surface of plane areas and volumes evaluation; infinite integrals.

Recommended literature:

Johnsonbaugh R., Pfaffenberger W.E., 2010: Foundations of mathematical analysis. Dover.
Apostol T.M., 1974: Mathematical Analysis, 2nd edition, Addison-Wesely.
Dettman J.W. 1968, Introduction to linear algebra and differential equations. Dover.

Languages necessary to complete the course:

English

Notes:

Past grade distribution

Total number of evaluated students: 33

A	B	C	D	E	FX
3,03	12,12	21,21	12,12	21,21	30,3

Lecturers: prof. RNDr. Roman Pašteka, PhD., doc. RNDr. Roland Karcol, PhD.

Last change: 06.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KIHG/N-bBCH-005/22	Mathematics 2

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 2 **per level/semester:** 14 / 28
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
Grading Policy (Assessment/Evaluation): Grades will be based on the final exam test (contributing 100%). During the term students have to complete problems solutions, which will be defined in the frame of exercises and only those, who will finish all of these problems solutions will be accepted for the final examination. The course has a standardized grading system which is identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Aims and Objectives:
This course covers selected topics from the basic theoretical background of mathematical analysis methods, used in the processing and interpretation of natural sciences experiments/datasets.

Class syllabus:
Syllabus/Indicative Content:
The concept of ordinary differential equation, types of solutions, initial and marginal conditions. Differential equation of the 1st order with separable variables. Linear differential equations of the 1st and 2nd order with constant coefficients – homogeneous equations; Linear differential equations with constant coefficients and with a special right-hand side. Real function of several variables; the limit and continuity of function; partial derivatives; the total differential of the function of more variables and its use; local extremes of functions of two variables. Differential operators of scalar and vector fields: gradient, divergence, rotation, Laplace's operator. Double integral, its geometric

significance and properties, calculation of double and triple integral; line integrals. Fundamentals of statistical description of datasets and probability theory - basic statistical parameters, sorting intervals, central values (mean, median, modus) and moments, random variables and functions, sampling distributions (focused on normal Gaussian distribution), confidence intervals and tests, dispersion and correlation analysis.

Recommended literature:

Johnsonbaugh R., Pfaffenberger W.E., 2010: Foundations of mathematical analysis. Dover.
Apostol T.M., 1974: Mathematical Analysis, 2nd edition, Addison-Wesely.
Dettman J.W. 1968, Introduction to linear algebra and differential equations. Dover.

Languages necessary to complete the course:

English

Notes:

Past grade distribution

Total number of evaluated students: 19

A	B	C	D	E	FX
5,26	0,0	15,79	10,53	21,05	47,37

Lecturers: prof. RNDr. Roman Pašteka, PhD., doc. RNDr. Roland Karcol, PhD.

Last change: 06.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-026/22	Methods in Molecular Biology

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
0,0	20,0	6,67	26,67	46,67	0,0

Lecturers: doc. Mgr. Andrea Šoltýsová, PhD., prof. RNDr. Hana Drahovská, PhD.

Last change: 25.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMV/N-bBCH-007/22	Microbiology

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture / practical
Number of contact 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.

Prerequisites:

Course requirements:
The final exam for students who completed Laboratory practice in Microbiology with a minimum grade E in the form of written test. The course has a standardized evaluating (grading) system: Grade A (100-92 %); B (91-84 %); C (83-76 %); D (75-68 %); E (67-60 %); FX (59-0 %).

Learning outcomes:
The course will provide general overview of the world of microorganisms - their diversity, activities, genetics, practical implications of their activities in medicine, industrial and food applications. Laboratory practice enables the students to acquire skills in basic microbiological methods.

Class syllabus:
History of microbiology, microbiology as one of the biological scientific disciplines, the subject of microbiology, methods used for study of microorganisms, research methods used in microbiology. Functional anatomy of prokaryotic and eukaryotic cells. Genetics of microorganisms, the structure of DNA, the structure of the gene, DNA replication, transcription, translation, mutations and mutagenesis, detection and isolation of mutants, gene transfer and recombination in prokaryotes and eukaryotes, extrachromosomal structures. The principles of taxonomy as scientific discipline, basic taxonomic classification of prokaryotic organisms Archaea and Eubacteria, classification of eukaryotic microorganisms: Fungi, Algae and Protozoa. Growth and nutrition of microorganisms, the growth curve, methods to measure the microbial growth, continuous cultivation, the impact of environmental factors on microbial growth, chemical and physical methods used in the control of the microbial growth. Metabolism of microorganisms, activation energy, catalysis, enzymes, oxidation, reduction, electron carriers, main energy stores in cells, release of energy in biological systems, fermentation, respiration, electron transport systems, carbon and electron flow in microbial cell. Microorganisms in the environment - soil, water, air. Biotic relationships between

microorganisms, types of symbiosis, antagonism, antibiosis, microbial biodegradation and biodeterioration. Microorganisms in biotechnology, industrially important fermentations, food microbiology, microbiology of functional nutrition. Microorganisms as human pathogens, pathogenicity and virulence. Control of microbial growth, physical and chemical methods of sterilization, disinfection and disinfectants, anti-infective chemotherapeutics and antibiotics, mode of actions of chemotherapeutics and antibiotics, resistance mechanisms to chemotherapeutics and antibiotics.

Recommended literature:

Wessner D., Dupont CH., Charles T.C.: Microbiology John Wiley & Son Inc. 2013;
Hogg S., Essential Microbiology, 2nd Edition, John Wiley & Son Inc. 2013, Prescott Microbiology 11 ed., Willey, Sherwood, Woolverto eds 2021,
Koči, K. Practical Microbiology, Laboratory manual and Workbook (2021) Publishes by Comenius University in Bratislava, ISBN 978-80-223-5128-7

Languages necessary to complete the course:

English

Notes:

Past grade distribution

Total number of evaluated students: 23

A	B	C	D	E	FX
26,09	21,74	13,04	4,35	8,7	26,09

Lecturers: prof. RNDr. Helena Bujdáková, CSc., RNDr. Jaroslava Dekkerová, PhD., prof. RNDr. Yvetta Gbelská, CSc., Mgr. Barbora Radochová, PhD., RNDr. Kamila Koči, PhD.

Last change: 12.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-011/22	Molecular Biology

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 4 **per level/semester:** 28 / 56
Form of the course: on-site learning

Number of credits: 7

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 31

A	B	C	D	E	FX
25,81	25,81	16,13	12,9	16,13	3,23

Lecturers: prof. RNDr. Ján Turňa, CSc., doc. RNDr. Ján Krahulec, PhD., Mgr. Michal Kajsik, PhD., Mgr. Zdenko Levarski, PhD.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-034/22	Molecular Spectroscopy

Educational activities:
Type of activities: practicals / lecture / seminar
Number of hours:
per week: 1 / 2 / 2 **per level/semester:** 14 / 28 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lectures, seminar, practicals
Number of contact hours: 2 h lectures, 2 h seminars, 1 h practicals
per week: 5 per level/semester: 45

Number of credits: 6

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
Course will be evaluated by a written test. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points. Credits will not be assigned to a student, who will not earn at least 60% overall from final exam.

Learning outcomes:
The aim of the course is to introduce basic principles of molecular spectroscopy and its applications in structure determination. The course deals with theoretical principles of spectroscopy and with factors influencing spectral characterics and their use in structural analysis of molecules. Primary focus is on most important methods of molecular spectroscopy such as NMR, MS, IR, UV-VIS, but principles and examples of application of other special techniques are also given. Basic experimental techniques are introduced to students. Seminars are devoted to solving spectra.

Class syllabus:
1. Overview of molecular spectroscopy methods. Basic principles. Vibrational spectroscopy. Vibrations of molecules, infrared and Raman spectroscopy. Experimental methods.
2. Vibrational spectroscopy, group frequencies and factors influencing group frequencies. Vibrational spectra in structural analysis. Vibrational circular dichroism.
3. Electronic spectroscopy. Physical principles. Electronic spectra of fundamental classes of organic compounds. Measurement of UV-VIS spectra and their use in structural analysis. Fluorescence and phosphorescence. Optical rotatory dispersion. Circular dichroism. Cotton efect.
4. NMR spectroscopy,fundamental physical principles, magnetic properties of nuclei. Survey of spectral parameters.
5. Chemical shift. Factors influencing chemical shift. 1H and 13C chemical shifts.
6. Spin-spin interaction, H-H, C-H coupling constant and chemical structure. First and second order spectra. Chemical and magnetic equivalency. Spectral analysis.

7. Relaxation, reactions on NMR time scale. Double resonance experiments. Nuclear Overhauser effect. Edited spectra.
8. 1D NMR experiments with complex pulse sequences. Two dimensional NMR. 2D J-resolved spectra. Homonuclear and heteronucklear chemical shift correlation. Through space correlation.
9. NMR spectroscopy in biochemistry and medicine. Solid state NMR. NMR imaging (MRI).
10. Principles of mass spectrometry. Types of MS spektrometry, consequence of isotopic ions, resolution of MS spectra, high resolution MS. Types of ionization, mass analysis.
11. General principles of ion-fragmentation. Mechanisms of fragmentations and rearrangements of ions. Interpretation of MS spectra, use in structural analysis.
12. Electron spin resonance (ESR), electron spin-levels in magnetic field g-factor. hyperfine structure. Laser spectroscopy. Time resolved spectroscopy.
13. Combined use of spectral methods. Solving structure of compound by spectral methods

Recommended literature:
J. B. Lambert: Organic Structural Spectroscopy, Prentice Hall, New Jersey, 1998.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 1

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

Lecturers: prof. Mgr. Radovan Šebesta, DrSc., Mgr. Ambroz Almássy, PhD., Mgr. Juraj Filo, PhD., RNDr. Marek Cigáň, PhD.

Last change: 13.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-036/22	Organic Chemistry

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 5 / 4 **per level/semester:** 70 / 56
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture and practical
Number of contact hours: 4 h of lectures and 5 h of practical
per week: 9 per level/semester: 117

Number of credits: 9

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
Course will be evaluated by a written test (60% value) and evaluation of practicals (40% value). For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points. Credits will not be assigned to a student, who will not earn at least 60% overall from final exam.

Learning outcomes:
This course covers the basics organic chemistry. By the end of this course students should be able to: • Understand properties of all major classes of organic compounds. • Understand mechanisms of principal organic reactions. • To solve new problems based on knowledge from lecture and training from seminars • To perform fundamental experimental techniques, analyze results, purify and identify compounds

Class syllabus:
1. Introduction to organic chemistry (nomenclature of organic compounds, bonding in organic compounds, basic principles of stereochemistry, electronic effects, acido-basic properties of organic compounds) 2. Properties and reactivity of major classes of organic compounds • alkanes, alkenes, alkynes and dienes • aromatic hydrocarbons • organic halogen derivatives • organometallic compounds • alcohols, tiols and phenols, ethers, epoxides and sulfides • nitrogen containing compounds – nitrocompounds and amines • carbonyl compounds – aldehydes, ketones, saccharides •
carboxylic acids and their functional derivatives, such as acyl halogenides, esters, amides, anhydrides • amino acids, peptides, proteins, lipids • heterocyclic compounds, nucleic acids. 3. Experimental work shall focus on safety in the organic chemistry laboratory, basic operations for isolation and purification of organic compounds (crystallization, distillation, extraction, adsorption chromatography - TLC). Simple syntheses of organic compounds will be trained based on functional

group transformations, isolation of organic compounds from natural sources, indentification of functional groups by chemical analysis and structure determination based on 1H NMR spectra.

Recommended literature:
J. McMurry, Organic Chemistry, Cengage Learning, 2009. J. Clayden, N. Greeves, S. Warren, Organic
Chemistry, Oxford University Press, 2012.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 19

A	B	C	D	E	FX
26,32	15,79	26,32	10,53	0,0	21,05

Lecturers: Mgr. Iveta Kmentová, PhD., prof. Mgr. Radovan Šebesta, DrSc.

Last change: 13.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-037/22	Organic Chemistry 2

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 **per level/semester:** 28 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture / seminar
Number of contact hours:
per week: 2 / 1 per level/semester: 26 / 13

Number of credits: 4

Recommended semester: 4., 6.

Educational level: I.

Prerequisites:

Course requirements:
Grades will be based on the results of seminar (activity and accomplishment of homeworks, weight 0.2), two written tests focused on understanding of mechanisms of organic reactions (weights 0.2 and 0.4) and oral exam (weight 0.2). More than 50% of points must be obtained from each part of the grading. The course has a standardized grading system which is identified below:
A (92 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (84 – 91 %): Good, competent work; laudable performance with evidence of some original thinking, good problemsolving ability, exhibiting a serious, responsible engagement with the course content.C (76 – 83 %): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (68 – 75 %). Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 67 %): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
This course provides overview of organic chemistry from the mechanistic point of view, based on advanced bonding theory. It covers also bifunctional derivatives, effect of reaction conditions, etc. Modern synthetic methods are also included.
By the end of this course students should be able to:
• Articulate a have general understanding of reaction mechanisms in organic chemistry, based on chemical structure, bonding, reaction conditions, etc.
• Propose synthetic approaches, describe detailed mechanism of the reaction with explanation of steric and electronic effects.

Class syllabus:

1) Introduction to the intermediate level of organic chemistry. Advanced understanding of bonding in organic compounds, delocalization and conjugation, electronic effects, orbital approach. Kinetics and thermodynamics of organic reactions.
2) Mechanisms of basic kinds of organic reactions. Electrophilic additions and substitutions. Nucleophilic substitutions and eliminations at saturated carbon, nucleophilic aromatic substitutions. Nucleophilic additions at carbonyl carbon. Reactions of enolates and conjugated additions. Radical reactions.
3) Selected modern methods in organic synthesis. Organometallic compounds and their applications in C–C bond formation. Chemoselectivity and regioselectivity, protection and transformation of functional groups.

Recommended literature:

J. Clayden, N. Greeves and S. Warren, Organic Chemistry, Oxford University Press, 2012.

Languages necessary to complete the course:

english

Notes:

offered in summer semester only

Past grade distribution

Total number of evaluated students: 3

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

Lecturers: doc. RNDr. Martin Putala, CSc.

Last change: 14.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-038/22	Organic Chemistry 2 – Practical Exercises

Educational activities:
Type of activities: practicals
Number of hours:
per week: 3 **per level/semester:** 42
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: seminar / laboratory exercises
Number of contact hours:
per week: 3 per semester: 39

Number of credits: 3

Recommended semester: 4., 6.

Educational level: I.

Prerequisites:

Course requirements:
Grades will be based on the results of practical work (weight 0.2 per each of three experiments) and final test (weight 0.4). Evaluation of each experiment consists of technique (50%), product yield and purity (25%) and protocol (25%). The course has a system which is identified below:
A (92 – 100%), B (84 – 91 %), C (76 – 83 %), D (68 – 75 %), E (60 – 67 %), Fx (under 60 %).

Learning outcomes:
This course is aimed to gain practical skills in advanced reaction and separation laboratory techniques, such as synthesis under inert reaction conditions, separation of the product by various distillation techniques (distillation under reduced pressure, fraction distillation, steam distillation), and preparative column chromatography.
By the end of this course students should be able to understand the skills, knowledge, and experience needed for organic synthesis and preparative separation of organic compounds.

Class syllabus:
1) Laboratory safety, theory of advanced laboratory techniques.
2) Synthesis of diethyl oxalate (diethyl succinate) – application of azeotropic distillation for water removal from the reaction mixture, purification of the product by distillation under reduced pressure, confirmation of the product identity by refractive index.
3) Preparation of triphenylmethanol – reaction under inert conditions, removal of constituents by steam distillation, purification of the product by crystallization, confirmation of the product identity by melting point.
4) Acylation of ferrocene with acetyl chloride – thin layer and preparative column chromatography, product identification (TLC, melting point).

Recommended literature:

L. M. Harwood, C. J. Moody, J. M. Percy, Experimental Organic Chemistry: Standard and Microscale,
Wiley, 1998.

Languages necessary to complete the course:
english

Notes:
offered in summer semester only, it is taught as a block at the end of the semester: 2h introductory seminar, 3 x 10-12h exercises, 2h final test

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: Mgr. Iveta Kmentová, PhD.

Last change: 14.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-035/22	Organic Synthesis

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 **per level/semester:** 28 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: 2 h lecture and 1 h seminar per week, full-time study
Number of hours:
per week: 2/1 per level/semester: 26/13
Form of the course: present

Number of credits: 4

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
There will be one running written test during the semester and the final test, each for 100 points. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points from both tests.

Learning outcomes:
This course covers the basic steps of organic synthesis. By the end of this course, students should be able to:
• Understand and design the methods for the introduction of functional groups into a molecule, their interconversion and removal.
• Know the properties of majority of protecting groups, their introduction and removal.
• Control the creation of carbon – carbon bonds.
• Design several alternatives for the synthesis of heterocyclic compounds of a specific type.

Class syllabus:
Introduction of halogen, nitrogen, oxygen and sulfur functional groups into a molecule.Radical and electrophilic halogenation. Addition to double and triple bonds. Sulfonation, chlorosulfonation, nitration, nitozation of aliphatic and aromatic compounds. Hydroboration, epoxidation and dihydroxylation. Vicarial nucleophilic substitution of aromatic compounds. Ozonolysis and oxidation.
Transformation of halogenoderivatives, alcohols, nitrogen and sulfur compounds. Nucleophilic substitution, reduction and elimination reactions. Reduction of nitro and nitrosoderivatives. Preparation and reactions of diazocompounds and diazonium salts. Syntesis of funcional derivatives of carboxylic acids.

Protecting groups – protection and deprotection, protecting of alcohols, tiols, amines, carbonyl compounds and carboxylic acids. Protection of reactive positions on benzene ring. Creation of C-C bonds. Alkylation and acylation of arenes, heteroarenes, alkynes, enolates and enaminies. Preparation and reactions of organomagnesium, organozinc and organocopper compounds. Coupling reaction of aromatic compounds. Aldolisation and relating reactions. Condensation reactions leading to alkenes. Wittig and relating reactions. Michael additions, Robinson annelation, Mannich reaction. Radical reactions and reactions of carbenes.
Synthesis of heterocyclic compounds. Nomenclature of heterocycles. 1,3-dipolar cycloadditions. Paterno-Buchi reaction. Standard synthesis of five-membered heterocyclic compounds – pyrroles, furanes, thiofenes, indoles, pyrazoles, imidazoles. Synthesis of sixmembered heterocycles – pyridines, pyrylium salts, pyrimidines, quinolines, purines.

Recommended literature:
M.B. Smith: Organic Synthesis, McGraw-Hill, Inc., 1994. P.J. Kocieński: Protecting groups, Thieme Stuttgart, 1994. G. S. Zweifel, M. H. Nantz: Modern Organic Synthesis, W. H. Freeman, 2006. Paul Wyatt, Stuart Warren: Organic Synthesis: Strategy and Control, Wiley, 2007.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: doc. RNDr. Peter Magdolen, PhD.

Last change: 13.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJCh/N-XXXX-011/21	Perspectives in Chemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3., 5.

Educational level: I., 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: 36

A	B	C	D	E	FX
27,78	41,67	13,89	2,78	0,0	13,89

Lecturers: RNDr. Marek Cigáň, PhD., doc. RNDr. Martin Putala, CSc., prof. Ing. Dušan Velič, DrSc., prof. RNDr. Ivan Černušák, DrSc., doc. RNDr. Erik Rakovský, PhD., Mgr. Peter Hrobárik, PhD., doc. RNDr. Oľga Rosskopfová, PhD.

Last change: 07.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-XXXX-010/22	Perspectives of Biochemistry

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4., 6.

Educational level: I., 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: 96

A	B	C	D	E	FX
93,75	0,0	0,0	0,0	0,0	6,25

Lecturers: doc. RNDr. Marek Mentel, PhD., Mgr. Filip Brázdovič, PhD., Mgr. Andrea Cillingová, PhD., prof. RNDr. Anton Horváth, CSc., Mgr. Stanislav Huszár, PhD., Mgr. Petra Chovančíková, PhD., prof. RNDr. Marta Kollárová, DrSc., doc. RNDr. Jana Korduláková, PhD., prof. RNDr. Katarína Mikušová, DrSc., Ing. Martina Neboháčová, PhD., doc. Mgr. Peter Polčic, PhD., RNDr. Ingrid Sveráková, PhD., doc. RNDr. Igor Zeman, PhD., Mgr. Júlia Zemanová, PhD.

Last change: 19.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFTCh/N-bBCH-043/22	Physical Chemistry - Fundamentals

Educational activities:
Type of activities: lecture
Number of hours:
per week: 3 **per level/semester:** 42
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
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: 5.

Educational level: I.

Prerequisites:

Course requirements:
Students take a course of lectures on the basics of physical chemistry. To better master this course, students are also offered optional subjects of laboratory exercises and seminars in physical chemistry. To start the course, it is necessary to have adequate knowledge of general chemistry and the basics of other courses in chemistry, mathematics, and physics which are in the plan in earlier semesters. Assessment of students' knowledge will be an oral examination or test. Grade scale: A 91-100%, B 81-90 %, C 71-80 %, D 66-70 %, E 60-65 %, Fx 59 % and less

Learning outcomes:
Students will gain main knowledge of the syllabus for all fundamental areas of physical chemistry. They will be able to apply gained knowledge to appoint and solve problems in various fields related to chemistry, qualitatively interpret phenomena, and understand basic physicochemical laws.

Class syllabus:
The lectures on the following topics of physical chemistry will include:
1. Basic physical quantities and chemistry laws 2. The Gas Laws and Kinetic Theory of Gases 3.The Laws of Thermodynamics, internal energy, work, enthalpy, and entropy, 4.Gibbs and Helmholtz Energies and Chemical Equilibrium, 5. Physical transformations of pure substance, 6. Simple mixtures, multi-component system,
7. Nonelectrolyte and Electrolyte Solutions, 8. Basics of Electrochemistry, 9. Acids and Bases, 10. Reactions and Chemical and Enzyme Kinetics, Catalysis, 11. The Chemical Bond and Intermolecular Force, 12. Physical chemistry in biological studies

Recommended literature:
Atkins, P., De Paula, J., & Keeler, J. (2017). Atkins' physical chemistry (11th ed.). Oxford

University Press.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
0,0	55,56	22,22	0,0	22,22	0,0

Lecturers: prof. RNDr. Juraj Bujdák, DrSc., doc. Ing. Marián Janek, PhD.

Last change: 18.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFTCh/N-bBCH-044/22	Physical Chemistry - Structure and physicochemical methods

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: lecture
Number of hours:
Per week: 2 per level/semester: 22
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:
The course will extend the previous series of physical chemistry lectures.
Knowledge from the previous course will be needed to understand some parts of this course. Lectures will be
more focused on the practical use of physical chemistry principles to educate students in understanding the
properties and structure of substances and their use, verified by the physicochemical methods. At the end of the course, there will be a test or verbal examination of the knowledge gained by the students. To start the course, it is necessary to have adequate knowledge of general chemistry and the basics of other courses in chemistry, mathematics, and physics which are in the plan in earlier semesters. It is strongly recommended to complete the course Physical Chemistry - Fundamentals before starting this course.
Grade scale: A 91-100%, B 81-90 %, C 71-80 %, D 66-70 %, E 61-65 %, Fx 59 % and less.

Learning outcomes:
Students will acquire basic knowledge of physical chemistry, which they can use to
understand basic laws and relationships between properties and structure of substances and to understand principles of physicochemical methods used in chemistry and related fields. Students will learn how to apply the fundamentals of basic physical chemistry to more advanced problems of various topics in this and related fields.

Class syllabus:
The lectures will be on the following topics of physical chemistry:
1. Colloid Chemistry, 2. Macromolecules and Aggregates, Characterization of Polymers,3. Spectroscopy - Principles, and Applications 4. Rotational and Vibrational Spectroscopy, 5. Electronic Transitions and UV-VIS Spectroscopy,6. Magnetic Resonance - NMR and EPR, 7.

Photochemistry and Photobiology, 8. Chemistry of Solids, Bonding and Crystal Structure, 9. Diffraction methods, 10. Structure of surfaces and Adsorption.

Recommended literature:
Atkins, P., De Paula, J., & Keeler, J. (2017). Atkins' physical chemistry (11th ed.). Oxford University Press.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
50,0	33,33	0,0	0,0	16,67	0,0

Lecturers: prof. RNDr. Juraj Bujdák, DrSc., doc. Ing. Marián Janek, PhD.

Last change: 18.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-101/22	Physical Education 1

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 744

A	B	C	D	E	FX
91,13	1,34	0,27	0,27	0,0	6,99

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-102/22	Physical Education 2

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 336

A	B	C	D	E	FX
94,35	0,0	0,0	0,0	0,3	5,36

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-103/22	Physical Education 3

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 440

A	B	C	D	E	FX
95,68	0,68	0,91	0,0	0,23	2,5

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-104/22	Physical Education 4

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 283

A	B	C	D	E	FX
96,82	0,35	0,35	0,35	0,0	2,12

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-105/22	Physical Education 5

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 349

A	B	C	D	E	FX
96,56	0,57	0,0	0,0	0,0	2,87

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-106/22	Physical Education 6

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 312

A	B	C	D	E	FX
95,83	0,0	0,0	0,0	0,32	3,85

Lecturers: Mgr. Kristína Vanýsková, PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Ján Krošlák, Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, PaedDr. Vladimír Pajkoš, Mgr. Dana Széllová, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFTCh/N-bBCH-046/22	Physical chemistry - practical exercises

Educational activities:
Type of activities: practicals
Number of hours:
per week: 5 **per level/semester:** 70
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: practicals
Number of hours:
Per week: 5 per level/semester: 65
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
Students will exercise experimental tasks aimed at various topics of physical chemistry. Before starting each exercise, students will be tested on theoretical knowledge of a particular topic. There will be a discussion on how to apply theoretical knowledge in solving practical tasks. After every exercise students will analyze gained experimental results and write reports. The final grade consists of two parts - Protocols with the reports (70%) and final test from theory, methodology, results, and tasks on solving the practical problems (30%). At least 50% from each part (protocols and final test) have to be obtained to pass the course.
Grade scale: A 92%-100%, B 84%-91%, C 76%-83%, D 68%-75%, E 61%-67%, Fx 60% and less.

Learning outcomes:
Students will receive skills in the methods of experimental physical chemistry. Using theoretical knowledge, they will be able to design simple experiments following brief instructions, measure selected physical-chemical quantities, analyze the experimental results, present the results of the analysis in the form of a spreadsheet, tables, or graphs, after application of simple statistical and mathematical methods. Students will be able to present, interpret and discuss their results from the point of view of the valid laws of physical chemistry.

Class syllabus:
Every student exercises 12 practicals focused on basic principles of Physical chemistry from the following subtopics:
1. Flow activation energy
2. Molar enthalpy of vaporization
3. Cryoscopy
4. Enthalpy of dissolution

5. Conductometry and conductometric titrations
6. Distribution equilibria
7. The stability constants of complexes
8. Spectrophotometry and Lambert-Beer law
9. Dissociation constant of acids and distribution diagrams
10. Refractometry vs. molecular structure and mixture
11. Temperature effect on chemical kinetics
12. Concentration effect on chemical kinetics
13. Potentiometric determination of solubility constant
14. Adsorption on phase interface
15. Oscillation reactions

Recommended literature:
Atkins, P., De Paula, J., & Keeler, J. (2017). Atkins' physical chemistry (11th ed.). Oxford University Press.

Languages necessary to complete the course:
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: Mgr. Daniel Furka, PhD., doc. Ing. Marián Janek, PhD.

Last change: 19.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KFTCh/N-bBCH-047/22	Physical chemistry - seminar

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
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.

Prerequisites:

Course requirements:
Students will exercise simple calculation tasks in various topics of physical chemistry. In every lesson, the theoretical background of a topic will be introduced and tasks will be solved by the students themselves under the supervision of the teacher. Students should be prepared for the course at least from the basics of the theory of the topic presented in the course Physical Chemistry. Students should have mastered the basic knowledge of mathematics to solve simple calculations. In specific cases, the teacher will explain an additional theory or supervise students helping them to solve the tasks required for better theory understanding. The final grade will be determined based on the results of the tests.
Grade scale: A 92%-100%, B 84%-91%, C 76%-83%, D 68%-75%, E 61%-67%, Fx 60% and less.

Learning outcomes:
Students will acquire basic skills in calculations of simple tasks aimed at the problems of physical chemistry. They will learn how to use theoretical knowledge, how to analyze tasks and perform calculations in physical chemistry, solve selected more complex tasks by breaking them down into simple subtasks. The benefit for the students can be not only for skills in the field of physical chemistry but also for other disciplines of chemistry where the methods of physical chemistry are used.

Class syllabus:
The exercises and tasks will be on the following topics of physical chemistry:
1. Basic physical quantities and chemistry laws, 2. The Ideal Gas Laws, 3. The Laws of Thermodynamics, internal energy, work, enthalpy, and entropy, 4. Gibbs and Helmholtz Energies and Chemical Equilibrium, 5. Physical transformations of pure substances, 6. Simple mixtures,

multi-component system, 7. Nonelectrolyte and Electrolyte Solutions, 8. Electrochemistry, 9. Acids and Bases, 10. Reactions and Chemical Kinetics, 11. Tasks on selected physicochemical methods.

Recommended literature:
Atkins, P., De Paula, J., & Keeler, J. (2017). Atkins' physical chemistry (11th ed.). Oxford University Press.

Languages necessary to complete the course:
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: Mgr. Daniel Furka, PhD., doc. Ing. Marián Janek, PhD.

Last change: 19.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KIHG/N-bBCH-006/22	Physics 1

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 2 **per level/semester:** 14 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: internal study (presence/online/combined)
Number of contact hours: 2 hours lecture and 1 hour practical per week
per week: 3 per level/semester: 39

Number of credits: 4

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
Grading Policy (Assessment/Evaluation): Grades will be based on the final exam test (contributing 100%). During the term students have to complete problems solutions, which will be defined in the frame of exercises and only those, who will finish all of these problems solutions will be accepted for the final examination. The course has a standardized grading system which is identified below:
A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Aims and Objectives:
This course covers the seleted basic theoretical background of physics, involved into the state of the art interpretation of natural sciences models.

Class syllabus:
Syllabus/Indicative Content:
Introduction into classical vs. modern physics, fundamentals of mechanics (mass point, dynamics and kinematics, uniform motion, uniformly accelerated motion and motion with time-variable

acceleration; Force, Newton’s laws, equation for the motion of a mass point, uniform circular motion; the work, kinetic and potential energy, conservation laws; Galileo's experiments, Keppler's laws, Newton’s gravitation law, center of mass of a system of particles and of a solid body, force moment, moment of inertia, Steiner’s theorem, the equations of movement for a solid body, movement in the gravitational field. Harmonic motion, damped and forced harmonic motion, combination of vibrations, wave equation, Huygens principle, interference of waves, Doppler effect; Introduction to the molecular physics and thermodynamics, ideal gas, Boltzmann’s distribution, pressure of the gas, absolute temperature, equation of state of an ideal gas, work of the gas, first law of thermodynamics, heat capacity, equipartition theorem. Electric charge, Coulomb’s law, intensity of electric field, electric dipole and its field, effect of electric field on a dipole, electric potential, capacity of the conductor, the energy of the electrostatic field of a condenser, dielectrics, polarization of a dielectric, permittivity of dielectric, the vector of electric induction. Ohm’s law, Kirchhoff’s laws and their use, Joule’s law; magnetic field, the vector of magnetic induction vs. magnetic intensity, magnetic permeability.

Recommended literature:

Keller F.J., Gettys W.E., Skove M.J., 1993: Physics, classical and modern. McGraw-Hill.
Tipler P.A., Mosca G., 2003: Physics for Scientists and Engineers. W. H. Freeman.
Feynman C., Leighton R., Sands M., 2010: The Feynman Lectures on Physics, New Millennium Edition. California Institute of Technology.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
48,28	24,14	13,79	0,0	0,0	13,79

Lecturers: prof. RNDr. Roman Pašteka, PhD., RNDr. Lukáš Félix Pašteka, PhD.

Last change: 06.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KIHG/N-bBCH-007/22	Physics 2

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 1 / 2 **per level/semester:** 14 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: internal study (presence/online/combined)
Number of contact hours: 2 hours lecture and 1 hour practical per week
per week: 3 per level/semester: 39

Number of credits: 3

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
Grading Policy (Assessment/Evaluation): Grades will be based on the final exam test (contributing 100%). During the term students have to complete problems solutions, which will be defined in the frame of exercises and only those, who will finish all of these problems solutions will be accepted for the final examination. The course has a standardized grading system which is identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
Aims and Objectives:
This course covers the seleted basic theoretical background of physics, involved into the state of the art interpretation of natural sciences models.

Class syllabus:
Syllabus/Indicative Content:
Elecromagnetic interaction: Lorentz’s force, speed filter and mass spectrometer; magnetic moment, Biot-Savart-Laplace's law; Ampere’s law, Faraday’s law of electromagnetic induction, Lorenz law; Maxwell’s equations in differential and integral form. Wave equation, electromagnetic

waves, Poynting vector; properties of electromagnetic waves (according to Maxwell's equations), refracting index, Fermat's principle, Snell's law, refraction and reflection of light; Fundamental terms of geometrical optics (paraxial rays, refraction plain, focus), image by means of a plane, convex and concave mirror, lenses, lens equation, magnifying glass, microscope, spectrograph, electron microscope, double refraction, interference, diffraction, absorption and polarization of light, the laws of radiation of the black body (Wien's, Rayleigh-Jeans and Planck's laws), photoelectric effect, Einstein's equation. Discrepancy of theory and experiment – motivation of introducing of quantum idea, new physical theories at the beginning of 20th century, theory of relativity, de Broglie wave, Bohr's model of hydrogen atom, energetic levels, mathematical machinery of quantum mechanics, wave function and its probabilistic interpretation, operators of quantum mechanics, mean value of a quantity; Heisenberg's uncertainty relations, Schrödinger equation (stationary and time- dependent), particle in a box, solution of the Schrödinger equation, stationary states; linear harmonic oscillator, the solution of Schrödinger equation, eigenvalues of the energy, eigenfunctions, Hermite's polynomials; potential barrier, tunneling, hydrogen atom, Laguerre polynomials, comparison with Bohr model; approximate solution of Schrödinger equation, solution for the hydrogen atom and its relation to the periodic table of elements; atomic nucleus and its models; elementary particles.

Recommended literature:

Keller F.J., Gettys W.E., Skove M.J., 1993: Physics, classical and modern. McGraw-Hill.
Tipler P.A., Mosca G., 2003: Physics for Scientists and Engineers. W. H. Freeman.
Feynman C., Leighton R., Sands M., 2010: The Feynman Lectures on Physics, New Millennium Edition. California Institute of Technology

Languages necessary to complete the course:

English

Notes:

Past grade distribution

Total number of evaluated students: 20

A	B	C	D	E	FX
65,0	10,0	10,0	0,0	0,0	15,0

Lecturers: prof. RNDr. Roman Pašteka, PhD., RNDr. Lukáš Félix Pašteka, PhD.

Last change: 06.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBo/N-XXXX-003/21	Plants known and unknown

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., 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: 839

A	B	C	D	E	FX
63,77	24,43	6,2	0,0	2,38	3,22

Lecturers: Ing. Mgr. Eva Zahradníková, PhD., doc. Mgr. Katarína Mišíková, PhD., doc. RNDr. Jana Ščevková, PhD.

Last change: 30.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KRGRR/N-XXXX-002/21	Practical Geography for Natural Scientists

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 1 / 1 **per level/semester:** 14 / 14
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., 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: 58

A	B	C	D	E	FX
84,48	0,0	0,0	0,0	0,0	15,52

Lecturers: Mgr. Rastislav Cákoci, PhD., RNDr. Katarína Danielová, PhD., doc. RNDr. Daniel Gurňák, PhD., doc. RNDr. František Križan, PhD., doc. RNDr. Eva Rajčáková, CSc., Mgr. Michala Sládeková Madajová, PhD., RNDr. Angelika Švecová, PhD., Mgr. Martin Šveda, PhD., prof. RNDr. Ladislav Tolmáči, PhD., RNDr. Mgr. Anna Tolmáči, PhD., Mgr. Gabriel Zubriczký, PhD.

Last change: 15.05.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KIHG/N-XXXX-012/21	Practical Geology for Everyone

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 1., 3., 5.

Educational level: I., 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: 185

A	B	C	D	E	FX
77,3	7,57	4,32	3,24	1,08	6,49

Lecturers: doc. RNDr. Renáta Fľaková, PhD., doc. RNDr. Renáta Adamcová, PhD., prof. RNDr. Roman Pašteka, PhD., prof. RNDr. Martin Bednarik, PhD., doc. RNDr. Dávid Krčmář, PhD., doc. RNDr. Andrej Mojzeš, PhD., RNDr. Ivana Ondrejková, PhD., doc. Mgr. Vladimír Greif, PhD., Mgr. Rudolf Tornyai, PhD., RNDr. Tatiana Durmeková, PhD., Mgr. Martin Zatlakovič, PhD., doc. RNDr. Milan Seman, CSc.

Last change: 18.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-038/22	Practical Training

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

Number of credits: 8

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Grades will be based on the final practical training report (contributing 100%), which has a standardized grading system identified below: A (91 – 100%): Outstanding, excellent work (exceptional performance with strong evidence of original thinking and obvious capacity to analyze, synthesize and evaluate. B (81 – 90 %): Good, competent work; laudable performance with evidence of some original thinking, good problem-solving ability, exhibiting a serious, responsible engagement with the course content. C (73 – 80%): Adequate, reasonably satisfactory work; fair performance but infrequent evidence of original thinking or the capacity to analyze, satisfies the minimum requirements of the course. D (66 – 72%): Less acceptable work; relatively weak performance with little evidence of original thinking or ability to analyze or synthesize course material. E (60 – 65%): Minimally acceptable work; very weak performance with little evidence of original thinking, showing inadequate grasp of some basic elements of the course. Fx (under 60%): Inadequate work; poor performance that indicates a lack of understanding or misunderstanding of essential subject matter.

Learning outcomes:
During practice, students will improve their skill in laboratory techniques and expand their theoretical knowledge in the study area and enables close collaboration with professional research groups.

Class syllabus:
The course represents three weeks of practical work after passing the exams in the summer semester. Students participating in the course of real research conducted in laboratories of Comenius University, Slovak Academy of Sciences and private research institutions led by experts working in the biological or chemical fields.

Recommended literature:
Specifically, as recommended by supervisor

Languages necessary to complete the course:
English

Notes:

The course can be completed only after the exams in the summer semester.

Past grade distribution
Total number of evaluated students: 3

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

Lecturers: prof. RNDr. Anton Horváth, CSc., doc. Mgr. Monika Okuliarová, PhD.

Last change: 27.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KŽFE/N-bBCH-024/22	Practical in Animal and Human Physiology, Cvičenia z fyziológie živočíchov a človeka

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: practical
Number of contact 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.

Prerequisites:

Course requirements:
Successful completion of this course requires mandatory participation in practical lessons and an achievement at least 60% score from each of 2 written tests. Moreover, students are evaluated by their activity and laboratory reports, which must submit from each practical lesson. Students are evaluated by A (if obtains at least 92% of a total score), B (if obtains at least 84% of a total score), C (if obtains at least 76% of a total score), D (if obtains at least 68% of a total score), E (if obtains at least 60% of a total score) and Fx (if obtains less than 60% of a total score).

Learning outcomes:
Students will learn and obtain practical laboratory skills through performing different laboratory tasks illustrating basic physiological principles. e.g. observation of osmosis and diffusion in various models, proof reactions for presence of proteins, lipids and saccharides, blood typing, measurement of lung volumes, quantitative measurement of oxygen dissolved in water by Winkler method, etc. By the end of this course, students will be able to perform, analyse and report on experiments and observations in physiology.

Class syllabus:
The syllabus follows the lectures from Animal and Human Physiology. The main themes are as follows: Biological membranes (osmosis and diffusion), Physiology of digestion (proteins, lipids, saccharides), Blood, Blood pressure monitoring, Body temperature and Thermoregulation, Excretion, Respiration, Reflexes, Physiology of the sensory system.

Recommended literature:
Sherwood L et al: Animal Physiology: From Genes to Organisms, 2nd ed. Cengage Learning, Inc, Florence, USA, pp 840, 2013.

Study materials for practical lessons.

Languages necessary to complete the course:

Notes:
This course is available only in winter semester and will be opened if at least 3 students enrol.

Past grade distribution
Total number of evaluated students: 14

A	B	C	D	E	FX
21,43	21,43	35,71	7,14	7,14	7,14

Lecturers: doc. Mgr. Monika Okuliarová, PhD., Mgr. Jana Zlacká, PhD.

Last change: 02.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-125/22	Professional English for Biological Chemistry Students 1

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study:
Number of contact hours:
per week: 2 hour seminar per level/semester: 26 hours
Blended learning

Number of credits: 3

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
The course has a standardized grading system which is identified below:
A (91–100%): Outstanding, excellent work; exceptional performance B (81–90%): Good, competent work; laudable performance. C (73–80%): Adequate, reasonably satisfactory work; fair performance. D (66–72%): Less acceptable work; relatively weak performance. E (60–65%): Minimally acceptable work; very weak performance. Fx (under 60%): Inadequate work; poor performance.

Learning outcomes:
This course covers improvement of Academic English reading, listening, speaking, and especially presentation skills necessary for next stages of the study. By the end of this course students should be able to:
1. Deliver a well-organized presentation.
2. Improve their reading and listening skills based on a variety of selected biology-focused articles and recordings.
3. Improve their speaking skills using mind-maps as an effective learning tool and enlarge a range of technical vocabulary.

Class syllabus:
This course will be focused on development of Academic English skills – reading, listening, speaking and particularly presenting. Application of a variety of effective tools (including e.g. mind-maps, signposting devices, organizing paragraphs, etc.) will help students organize their thoughts clearly and transparently when writing or speaking. This course will help students prepare for a well-organized presentation and polish their speaking skills for a successful speech. Particular attention will be paid to the structure of presentation, verbal delivery, body language, and a slide layout. This course also provides a guide to English grammar that is specifically tailored to the needs of science

students in order to use correct grammatical structures with confidence. Moreover, this course will immerse students in a wide range of biological topics through reading and listening to selected recordings that will remarkably contribute to enlarging their technical vocabulary.
Topics covered in the course include: Extinction of the Giants (hypothesis vs. theory, irregular and foreign plurals); DNA, Cloning and CRISPR Cas9 (Passive Voice, Tentative Statements, Capitalisation of the Titles); De-extinction; Flu (Flu virus, Antigenic drift and antigenic shift); Spanish Flu; Academic Article Analysis (Using Tenses in Academic Writing); Listening Journal from a TEDtalk, Final presentation (10-15 minutes).

Recommended literature:
Writing Professional English (CD)
Collection of materials prepared by Language Department teachers (available on Moodle)

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 24

A	B	C	D	E	FX
79,17	12,5	0,0	0,0	4,17	4,17

Lecturers: RNDr. Tatiana Slováková, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KJ/N-bXCJ-126/22	Professional English for Biological Chemistry Students 2

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Number of contact hours:
per week: 2 hour seminar per level/semester: 26 hours
Blended learning

Number of credits: 3

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
The course has a standardized grading system which is identified below:
A (92–100%): Outstanding, excellent work; exceptional performance B (84–91%): Good, competent work; laudable performance. C (76–83%): Adequate, reasonably satisfactory work; fair performance. D (68–75%): Less acceptable work; relatively weak performance. E (60–67%): Minimally acceptable work; very weak performance. Fx (under 60%): Inadequate work; poor performance.

Learning outcomes:
This course covers improvement of Academic English reading, listening, speaking, and presentation skills necessary for next stages of the study. By the end of this course students should be able to:
1. Deliver a well-organized presentation.
2. Improve their reading and listening skills based on a variety of selected chemistry-focused articles and recordings.
3. Improve their speaking skills and enlarge a range of technical vocabulary.

Class syllabus:
This course will be focused on development of Academic English skills – reading, listening, speaking and particularly presenting.
Application of a variety of effective tools (including e.g. mind-maps, signposting devices, organizing paragraphs, etc.) will help students organize their thoughts clearly and transparently when writing or speaking. This course will help students prepare for a well-organized presentation and polish their speaking skills for a successful speech. Particular attention will be paid to the improvement of the structure of presentation, verbal delivery, body language, and a slide layout. This course also provides a guide to English grammar that is specifically tailored to the needs of science students in order to use correct grammatical structures with confidence. Moreover, this

course will immerse students in a wide range of chemistry topics through reading and listening to selected recordings that will contribute to enlarging their technical vocabulary.
Topics covered in the course include: A Life of Chemistry (lab equipment and lab safety vocabulary, definite and indefinite articles); Mixtures and Separation Methods (word formation using negative prefixes: in-, il-, ir-, im-, un-, dis-, a -...e.g. achiral, insoluble, anhydrous, irreversible, inorganic; do and make phrases), Metals and Their Properties (present perfect simple/continuous vs. past simple; AE vs. BE; comparing/contrasting); Green chemistry; Chemistry of Perfumes; Listening Journal from a TEDtalk + discussion, Final presentation (10-15 minutes)

Recommended literature:
Writing Professional English (CD)
Collection of materials prepared by Language Department teachers (available on Moodle)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 21

A	B	C	D	E	FX
66,67	14,29	0,0	4,76	0,0	14,29

Lecturers: Mgr. Barbara Kordíková, PhD.

Last change: 26.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-025/22	Regulation of Gene Expression

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 10

A	B	C	D	E	FX
10,0	20,0	40,0	30,0	0,0	0,0

Lecturers: prof. RNDr. Ján Turňa, CSc., Mgr. Michal Kajsik, PhD., Mgr. Zdenko Levarski, PhD.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-110/22	River rafting

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

Number of credits: 1

Recommended semester: 2., 4., 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 96

A	B	C	D	E	FX
53,13	0,0	0,0	0,0	0,0	46,88

Lecturers: PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, Mgr. Kristína Vanýsková, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAlCh/N-bBCH-038/22	Seminar in Analytical Chemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Number of contact hours:
per week: 2 per level/semester: 26
on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I.

Prerequisites:

Course requirements:
Seminar – a maximum of 100 points, for active participation in seminars - a maximum of 30 points, for elaboration and presentation of a seminar paper – a maximum of 70 points. For grade A it is necessary to obtain at least 92 points, for grade B at least 84 points, for grade C at least 76 points, for grade D at least 68 points and for grade E at least 60 points.

Learning outcomes:
The objective involves calculations in analytical chemistry and solution of model situations from social practice, which are discussed in daily press and information media. Students will solve case studies from biochemistry, biotechnology, and other natural sciences. The current use of analytical chemistry methods and their future potential and an outline of their development trends will be discussed. Students will get acquainted with the possibility of analysis of biomedical, environmental, food and pharmaceutical samples.

Class syllabus:
• History of analytical chemistry in the context of the development of society.
• Methodology of analytical procedure.
• Working characteristics of the analytical methods. Calculation of measurement errors.
• Examples of the use of sample preparation procedures in chemical analysis.
• Analytical use of neutralization, precipitation, redox and complexometric titrations.
• Chemical stoichiometry.
• Analytical applications of equilibrium potentiometry, voltammetry, coulometry and conductometry.
• Analytical applications of atomic spectrometry methods.
• Analytical applications of molecular spectrometry and non-spectral optical methods.
• Analytical applications of mass spectrometry.
• Application of separation methods in chemical analysis.

• The combined application of analytical methods to solve selected analytical problems.
• Practical examples of the use of analytical techniques in chemical analysis procedures in solving current practical problems.
Individual topics of seminar work will include examples of practical use of analytical techniques mentioned above in food, environmental and pharmaceutical analysis and bioanalysis.

Recommended literature:
D.A. Skoog, F.J. West, F.J. Holler, S.R. Crouch: Analytical Chemistry. An Introduction, Saunders Coll. Publ., 2000.
Current monographic and original article literature and information sources on the Internet.
Original and review articles in scientific journals.

Languages necessary to complete the course:
English

Notes:
The course is provided only in the summer semester. If less than 3 students enroll, the course will be provided in individual form.

Past grade distribution
Total number of evaluated students: 13

A	B	C	D	E	FX
46,15	30,77	15,38	0,0	0,0	7,69

Lecturers: prof. RNDr. Marian Masár, PhD., Ing. Roman Szücs, PhD., Mgr. Jasna Hradski, PhD.

Last change: 03.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-036/22	Seminar in Biochemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Type of activities: seminar
Number of hours:
per week: 2 per level/semester: 26
Form of the course: on-site learning / online learning

Number of credits: 2

Recommended semester: 3.

Educational level: I.

Prerequisites:

Course requirements:
During the semester students write 10 tests each by 8 to 15 points. Final grade: 100-90% A, 89-80% B, 79-70% C, 69-65% D, 64-60% E, Fx-less than 60%

Learning outcomes:
Seminar is focused on discussions on topics covered by the course Biochemistry, in which students are introduced to biochemical processes taking place in living organisms. After completing the course, they will understand chemical structure of biomolecules in relation to their functions, they will comprehend basics of enzyme catalysis and intermediary metabolism.

Class syllabus:
1. Carbohydrates. Classification, physico-chemical and biological properties of carbohydrates. Stereochemistry: configuration, conformation, enantiomer, epimer, diastereomer, mutarotation, α-, β-anomers. Glycosidic bond. Oligosaccharides and polysaccharides. Structural polysaccharides, storage polysaccharides - bonds, structures.
2. Amino Acids and Proteins. General formula of AA, classification of AA, formulas of AA, optical activity, spectroscopic properties of AA, acid-base properties of AA, zwitterions, amphoteric character of AA, isoelectric point, structure and properties of the peptide bond. Three-dimensional structure of proteins - primary, secondary (α-helix, β-pleated sheet, β-turn), tertiary, quaternary; bonds (interactions) and functional groups implied in these structures. Classification of proteins according to structure and solubility (fibrous, globular, membrane proteins). Biological functions of proteins, native conformation, denaturation, renaturation.
3. Enzymes. Holoenzyme, apoenzyme, cofactor, coenzyme, prosthetic group. Classification of enzymes. Active site, specificity of enzymes. Mechanism of action of enzymes – “lock and key”, “induced fit”. Activation energy, transition state. Enzyme kinetics, Michaelis - Menten

equation, parameters KM and Vmax; enzyme inhibition - irreversible, reversible - competitive, uncompetitive, mixed. Regulation of enzyme activity - allosteric modification, covalent modification, regulatory proteins, proteolytic cleavage (zymogens).
4. Lipids and Membranes. Functions of the lipids. Structure and properties of fatty acids. Storage lipids: triacylglycerols (fats, oils), waxes. Membrane lipids: glycerophospholipids, sphingolipids, sterols. Amphipathic character of some lipids, aggregated forms of lipids - micelles, bilayers. Biological membranes, membrane proteins, fluid mosaic model.
5. Introduction to metabolism. Sources and transformations of energy in the biosphere. Laws of thermodynamics (1st and 2nd). Chemical energy - enthalpy, free (Gibbs) energy, entropy. Endergonic, exergonic reactions. Carriers of chemical energy. ATP – its role and production in the living systems (substrate-level phosphorylation, oxidative phosphorylation, photophosphorylation). Catabolic and anabolic metabolic pathways. Energy relationships between catabolic and anabolic pathways. Oxidation of biomolecules.
6. Metabolism of glucose. Glucose as a source of metabolic energy. Glycolysis - significance, localization, 2 phases of glycolysis, individual reactions, intermediates and enzymes of glycolysis. Fate of pyruvate. Lactic fermentation, alcoholic fermentation. Gluconeogenesis - significance, substrates, three unique gluconeogenetic steps (4 enzymes), localization. Cori cycle, transfer of lactate from muscle to liver, formation of glucose from lactate. Pentose phosphate pathway: significance, formation of NADPH, ribulose-5-phosphate, reactions catalyzed by dehydrogenases, isomerase, epimerase, transaldolases, transketolase.
7. Krebs cycle. Glyoxylate cycle. Formation of acetyl-coenzyme A from pyruvic acid. Krebs cycle as a source of energy and biosynthetic precursors, cellular localization of the cycle. Krebs cycle reactions, individual intermediates and enzymes. Amphibolic character of the citrate cycle, anaplerotic reactions (pyruvate carboxylase). Glyoxylate cycle - importance for plants and bacteria, localization, enzymes.
8. Metabolism of fatty acids. Fatty acids as a source of metabolic energy. Fats digestion - bile acids, lipases, chylomicrons. The fate of fatty acids in muscle and adipose tissue. Release of fatty acids from adipose tissue and their transfer to tissues. β-oxidation of fatty acids - localization in the cell, transfer of fatty acids to mitochondria (carnitine function). b-oxidation reactions, formation of acetyl-coenzyme A. Fate of acetyl-coenzyme A - entry into the citrate cycle. Fatty acid biosynthesis - comparison with β-oxidation, reactions. Sources of NADPH. Transport of fat and cholesterol in humans, roles of lipoproteins.
9. Oxidative phosphorylation. Structure and functions of mitochondria. Composition and function of the respiratory chain, electron transporters - cytochromes, iron-sulfur proteins, ubiquinone, flavoproteins. The source of electrons entering the respiratory chain. Electron transfer in the respiratory chain (complexes I, II, III, IV, cyt c, ubiquinone). Proton gradient. ATP synthesis, ATP-synthase. Chemiosmotic theory. Alternative use of proton gradient - thermogenesis, movement of bacteria, transport of metabolites.
10. Photosynthesis. Structure and function of chloroplasts. Pigments and their role in photosynthesis. Photochemical reaction centers. Electron transfer by photosystems I and II. Non-cyclic and cyclic photophosphorylation. Photolysis of water. Production of NADPH. Synthesis of carbohydrates during photosynthesis. Three stages of CO2 assimilation. Basic reactions and function of Calvin cycle.
11. Degradation of amino acids and urea cycle; metabolism of nucleotides. Deamination, transamination and decarboxlation of amino acids. Amino-transferases. Fate of NH4+ in various organisms. Urea cycle and its interconnection with citric acid cycle. Biosynthesis of ribonucleotides and deoxyribonucleotides de novo and by salvage reactions. Degradation of nucleic acids. Degradation of purine and pyrimidine bases.

12. Nucleotides and Nucleic Acids. Nitrogenous bases found in RNA and DNA. Nucleosides and nucleotides – their structure and components (nucleobases, sugar, phosphoric acid). Structure of deoxyribonucleic acid: (i) primary structure; (ii) secondary structure and its discovery; (iii) ABZ forms of the secondary structure; (iv) another alternative forms of the secondary structure (cruciform, G-quadruplex, Hoogsteen base pairing); (v) tertiary structure (supercoils, topoisomerases). DNA replication enzymes and the rules – semiconservative, bidirectional, semidiscontinuous (Okazaki fragments). DNA denaturation. Chromosome structure in eukaryotes – the nucleosome and nuclear DNA packing levels. DNA/RNA differences. Structure of ribonucleic acid: (i) primary structure; (ii) secondary structure; (iii) tertiary structure. Various forms of RNA serving different functions in cell – mRNA, rRNA, tRNA, snRNA, snoRNA, ncRNA.
13. Transfer of genetic information. Transcription: General features of transcription, prokaryotes and eukaryotes comparison. Transcription in prokaryotes: initiation, elongation, termination. Transcription in eukaryotes: initiation, elongation, termination and introduction to the mRNA processing. Inhibitors of transcription in prokaryotes and eukaryotes. Genetic code and Translation: Structure of tRNA. Function of tRNA in translation. Genetic code, its features (triplet code, continuous, not overlapping, degenerate, unambiguous, universal). Decoding of the standard genetic code. Natural and unnatural variations in the standard genetic code. Loading the tRNAs and aminoacyl-tRNA synthetases. Codon-Anticodon pairing. Ribosome, its structure, prokaryotes and eukaryotes comparison. Translation – protein synthesis mechanism and stages: initiation, elongation, termination. Translation elongation cycle three principal steps: codon-directed binding, peptide bond formation (ribosome is ribozyme), translocation. Molecular mimicry. Inhibitors of protein synthesis.
14. Recombinant DNA, artificial manipulation with Nucleic acids. Cloning of DNA: history, plasmids, restriction enzymes, ligases, linkers and polylinkers, shuttle vectors. Genomic gDNA library and complementary DNA cDNA library. Preparation of gDNA library and cDNA library. Particular DNA segment identification by hybridization – Southern blotting. Colony hybridization. Polymerase chain reaction – PCR cycle stages: heating, cooling, polymerization. DNA primary structure determination – DNA sequencing methods: Sanger method and Maxam-Gilbert chemical cleavage method.

Recommended literature:
Nelson, D. L. a Cox, M.M. (2017) Lehninger Principles of Biochemistry, W.H. Freeman;
Berg J.M., Tymoczko J.L., Gatto G.J. a Stryer L. (2019) Biochemistry, MacMillan

Languages necessary to complete the course:
English

Notes:
Taking Biochemistry class is required to sign up for this course.

Past grade distribution
Total number of evaluated students: 20

A	B	C	D	E	FX
10,0	15,0	30,0	15,0	15,0	15,0

Lecturers: doc. RNDr. Marek Mentel, PhD., prof. RNDr. Katarína Mikušová, DrSc.

Last change: 16.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAgCh/N-bBCH-035/22	Seminar in General and Inorganic Chemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 4 **per level/semester:** 56
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: I.

Prerequisites:

Course requirements:
There will be two running written test examinations (maximum 50 points each) during the semester course.
Credits will not be assigned to a student, who will not earn at least 60% from both written tests.
For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points.

Learning outcomes:
This course covers the topics of the course "General and Inorganic Chemistry" which will be practiced on various examples, exercises and tasks.

Class syllabus:
Nomenclature of inorganic compounds. Chemical reactions, formulae and equations. Structural formulae. Atomic structure; molecular structure. Models of chemical bonding. Hybridization. VSEPR theory. Molecular orbital theory. Bond polarity; electronegativity; oxidation number; ionic bond; hydrogen-bonding; van der Waals interactions. Enthalpy; entropy; laws of thermodynamics; thermochemical laws. Phase – phase transitions. Solid state – structures. The principles of chemical kinetics: reaction rate and order; mechanism; catalysis. Chemical equilibrium. Electrolytic dissociation; Acid-base theories. pH – simple calculations. Hydrolysis. Precipitation reactions. Oxidation and reduction.
Discussion on elements and their basic compounds.

Recommended literature:
Duward Shriver, Peter Atkins: Inorganic Chemistry, 5th edition, 2010, Oxford University Press
Stephen Lower: Chem1 virtual textbook a reference text for General Chemistry
http://www.chem1.com/acad/webtext/virtualtextbook.html

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 25

A	B	C	D	E	FX
8,0	32,0	28,0	24,0	8,0	0,0

Lecturers: Dr. James Richard Asher, PhD., prof. RNDr. Jozef Noga, DrSc.

Last change: 06.10.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KOrCh/N-bBCH-039/22	Seminar in Organic Chemistry

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: seminar
Number of contact hours: 2 h of seminars
per week: 2 per level/semester: 26

Number of credits: 2

Recommended semester: 2.

Educational level: I.

Prerequisites:

Course requirements:
Course will be evaluated by a written test. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % of all points. Credits will not be assigned to a student, who will not earn at least 60% of points in the test.

Learning outcomes:
This course aims to improve understanding of basics organic chemistry via individual students work on the seminars, were assignements on topic from the organic chemistry lecture will be discussed. By the end of this course students should be able to understand properties of all major classes of organic compounds, understand mechanisms of typical organic reactions, to solve new problems based on knowledge from lecture and training from seminars.

Class syllabus:
Introduction to organic chemistry - nomenclature of organic compounds, bonding in organic compounds, basic principles of stereochemistry, electronic effects, acido-basic properties of organic compounds). Properties and and typical reactions (both syntheses of specific compounds as well as their reactions) of major classes of organic compounds: alkanes, alkenes, alkynes and dienes; aromatic hydrocarbons; organic halogen derivatives; organometallic compounds; alcohols, tiols and phenols, ethers, epoxides and sulfides; nitrogen containing compounds – nitrocompounds and amines; carbonyl compounds – aldehydes, ketones, saccharides; carboxylic acids and their functional derivatives, such as acyl halogenides, esters, amides, anhydrides; amino acids, peptides, proteins, lipids; heterocyclic compounds, nucleic acids. Basics of multistep organic synthesis will practiced on seminars too. Attention will be also devoted to basic applications of spectroscopy techniques, mainly 1H NMR.

Recommended literature:

J. McMurry, Organic Chemistry, Cengage Learning, 2009. J. Clayden, N. Greeves, S. Warren, Organic
Chemistry, Oxford University Press, 2012.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
26,09	8,7	13,04	8,7	21,74	21,74

Lecturers: Mgr. Ambroz Almássy, PhD.

Last change: 13.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-027/22	Seminar on Methods in Molecular Biology

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 19

A	B	C	D	E	FX
5,26	15,79	5,26	31,58	36,84	5,26

Lecturers: doc. Mgr. Andrea Šoltýsová, PhD., prof. RNDr. Hana Drahovská, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-030/22	Seminar on Topics in DNA Analysis Methods

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
28,57	57,14	14,29	0,0	0,0	0,0

Lecturers: doc. Mgr. Andrea Šoltýsová, PhD., prof. RNDr. Hana Drahovská, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KAlCh/N-bBCH-014/22	Separation Methods

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 **per level/semester:** 28 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Number of contact hours:
per week: 2 / 1 per level/semester: 26 / 13
on-site learning, online learning

Number of credits: 4

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:
Seminar – a maximum of 40 points, for elaboration and presentation of a seminar paper. Lecture – a maximum of 60 points, for the final test. The final grade will consist of evaluation of seminar and the final test from lecture, for a maximum of 100 points. For grade A it is necessary to obtain at least 92 points, for grade B at least 84 points, for grade C at least 76 points, for grade D at least 68 points and for grade E at least 60 points. The evaluation is the same for on-line learning.

Learning outcomes:
Students will get acquainted with the position of separation methods within the system of scientific cognition of material reality and their essential need in generation of interpretable analytical signal. Objective is taught through a unified approach based on the concept of transport and distribution phenomena, which are applied in many modern separation methods. Separation methods are often the basis of chemical analysis methods. They are also base for qualitative evidence and quantitative measurement of characteristics or determination of chemical substances utilized in various human activities and related control, e.g., technological product analysis, bioanalysis, environmental analysis, clinical analysis, and diagnostics, etc. Students will gain information about the classification of analytical, preparative, and industrial separation processes and methods. The course also includes calculations in the field of separation sciences and solving case studies from social practice, which are discussed in the media.

Class syllabus:
• Characteristics of separation methods, their function and significance in analytical, preparative, and industrial processes.
• General terms and parameters characterizing the scope of separation; terminology; distribution ratio, distribution constant, Nernst distribution law, chemical equilibrium in separation process. Interactions in separation systems. Calculations, thermodynamic and kinetic aspects of separation methods.

• One-stage separation methods, principle, technique, and application; separation of components by precipitation and co-precipitation. Sublimation, lyophilization. Electroprecipitation, electrolytic precipitation. Extraction separation in the system solid-liquid, liquid-liquid. Cloud point extraction – micellar systems. Membrane extraction. Simple distillation. Zone melting.
• Multistage separation methods and introduction to chromatographic methods. Multistage extraction, principle of continuous extraction. Multistage distillation. Chromatographic separations, classification according to various criteria. Theory of chromatographic phenomena, qualitative and quantitative chromatographic analysis.
• High-performance gas chromatography. Instrumentation. Separation mechanisms. Optimization of separation. Advanced techniques. Reaction chromatography, precolumn derivatization, vacant chromatography. Computer simulations and calculations.
• High performance liquid chromatography. Instrumentation, column vs planar techniques. Chromatographic phase systems. Advanced techniques. Computer simulations and calculations. Separation mechanisms. Pre-column and post-column derivatization (physical, chemical, and biological). Typical applications of chromatographic methods.
• Electroseparation methods. Principles, classification, parameters characterizing electroseparation. Concept of electrophoretic mobility, separation mechanisms, column vs. planar techniques, column coupling technique and detection. Zone electrophoresis. Separations in the free solution of carrier electrolyte. Separations in micelle-forming solutions, micellar electrokinetic chromatography. Electroosmotic flow. Instrumentation and practical use of computer simulation technique.
• Capillary isotachophoresis and isoelectric focusing. Basic principles, instrumentation and computer simulation technique. Separation, and analysis of proteins.
• Chip-based electroseparations. Miniaturization of separation columns and channels. Instrumentation and novel approaches to electroseparations. Advances and applications of chip-based electroseparations.
• Membrane separations. Principles, classification. Dialysis and electrodialysis, principle, instrumentation, and application. Ultrafiltration – application in analytical procedures. Validation of analytical methods with focus on separation methods.
• Solution of case studies from various areas of social and production practice. Typical application of separation methods in analytical procedures, preparative, and industrial procedures. Future trends in the development of separation methods.

Recommended literature:

D.A. Skoog, F.J. West, F.J. Holler, S.R. Crouch: Analytical Chemistry. An Introduction, Saunders Coll. Publ., 2000.
G. Schwedt: The Essential Guide to Analytical Chemistry, Wiley, New York, 1997.
R. Kellner, J.M. Mermet, M. Otto, Analytical Chemistry, John Wiley & Sons Australia, 2013.

Languages necessary to complete the course:

English

Notes:

The course is provided only in the winter semester. If less than 3 students enroll, the course will be provided in individual form.

Past grade distribution

Total number of evaluated students: 13

A	B	C	D	E	FX
30,77	61,54	7,69	0,0	0,0	0,0

Lecturers: prof. RNDr. Marian Masár, PhD., Ing. Roman Szücs, PhD., Mgr. Jasna Hradski, PhD.

Last change: 28.03.2023
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KBCh/N-bBCH-023/22	Structure and Functions of Biomolecules

Educational activities:
Type of activities: lecture / seminar
Number of hours:
per week: 2 / 1 **per level/semester:** 28 / 14
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture / seminar
Number of contact hours:
per week: 2 / 1 per level/semester: 22 / 11
on-site learning

Number of credits: 4

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:
Presence at seminars. Obtaining 50% of both parts is a prerequisite for successful completion of the subject. Assessment from the seminar will be 30% and written test at the end of Lecture course 7 0% of the total subject assessment. For grade A, it is necessary to obtain at least 92 %, for grade B at least 84 %, for grade C at least 76 %, for grade D at least 68 % and for grade E at least 60 % from all points.

Learning outcomes:
1. Insight into various types of gene expression regulations.
2. Biological relevance of DNA and RNA modification.
3. Biochemistry of macromolecules: lipids, proteins, and carbohydrates. Synthesis, turnover, functions, and analysis.
4. Thermodynamic of enzymatic reactions.
5. Enzyme catalysis. Michaelis-Menten equation.
6. Enzyme regulations.

Class syllabus:
Regulation of gene expression, initiation of RNA transcription, gene regulatory proteins (a.k.a. transcription factors) and their binding to DNA, DNA structures as target for regulatory proteins (e.g. helix-turn-helix, leucine zipper, helix-loop-helix, zinc fingers).
· Biological relevance of DNA and RNA modification - methylation of CpG islands, N6-methyladenosine in mRNA, tRNA modifications and translation.
· Carbohydrates – Cell wall polysaccharides of bacteria and plants: structure, function, biosynthesis. Carbohydrates in health and disease.
· Structural components of proteins - amino acids - properties, peptide bond formation, reactions

in biochemistry - thermodynamics of chemical reactions, the transition state of a chemical reaction, non-covalent interactions.
· Lipids - Functional roles of lipids in membranes. Synthesis of phospholipids and sterols. ntramembrane and intermembrane lipid transport. Lipid modification of proteins. Approaches to lipid analysis.
· Steady-state kinetics of the one substrate reaction; time course of enzyme-catalyzed reactions. Michaelis-Menten equation and its transformation, enzyme inhibition. Experimental measurement of enzyme activity - measuring the initial speed; detection methods, factors affecting the rate of enzyme reaction, enzyme stability. Enzyme reactions with multiple substrates.
· Mechanisms of enzyme catalysis. Examples of mechanisms of enzymatic catalysis and its regulation - serine proteases, aspartic acid proteases, glutathione reductase, hexokinase.
· Enzyme regulation - zymogens, isoenzymes, covalent modification, allosteric enzymes. Enzyme Engineering - stabilization of enzymes, change the properties of enzymes by gene manipulations.
Seminars
· The theme of seminar renders the syllabus of lecture. Seminars focus on solving of practical problems related to corresponding lecture.

Recommended literature:
1. Berg, J. M, Tymoczko, J. L, Gatto, Jr., G. J., Stryer, L. (2015). Biochemistry, 8th Edition, W. H. Freeman and Company (The 7th edition is also sufficient).
2. Nelson, D. L., Cox, M. M. (2017). Lehninger Principles of Biochemistry, 7th Edition, W. H. Freeman, Macmillan Learning (The 6th edition is also sufficient).

Languages necessary to complete the course:
English

Notes:
The course is provided only in the summer semester.

Past grade distribution
Total number of evaluated students: 10

A	B	C	D	E	FX
20,0	50,0	20,0	10,0	0,0	0,0

Lecturers: RNDr. Ingrid Sveráková, PhD., doc. RNDr. Jana Korduláková, PhD., doc. RNDr. Marek Mentel, PhD., prof. RNDr. Katarína Mikušová, DrSc., Ing. Martina Neboháčová, PhD.

Last change: 27.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-108/22	Summer Physical-Education Training

Educational activities:
Type of activities: training session
Number of hours:
per week: **per level/semester:** 5d
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 94

A	B	C	D	E	FX
67,02	0,0	0,0	0,0	0,0	32,98

Lecturers: PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, Mgr. Kristína Vanýsková, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-041/22	Theoretical and experimental medicine

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
0,0	0,0	12,5	31,25	50,0	6,25

Lecturers: doc. MUDr. Ing. Peter Celec, DrSc., Mgr. Veronika Borbélyová, PhD., doc. RNDr. Ľubomíra Tóthová, PhD., doc. MUDr. RNDr. Roman Gardlík, PhD., doc. RNDr. Barbora Vlková, PhD., Mgr. Barbora Tamášová, PhD., Mgr. Michal Pastorek, PhD.

Last change: 09.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KZ/N-XXXX-006/21	Theory of species

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4., 6.

Educational level: I., 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: 179

A	B	C	D	E	FX
63,69	13,41	3,91	1,12	0,56	17,32

Lecturers: doc. Mgr. Peter Vďačný, PhD.

Last change: 07.11.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMB/N-bBCH-029/22	Topics in DNA Analysis Methods

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 28
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 6.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

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

Lecturers: doc. Mgr. Andrea Šoltýsová, PhD., prof. RNDr. Hana Drahovská, PhD.

Last change: 24.07.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KMV/N-bBCH-008/22	Virology

Educational activities:
Type of activities: practicals / lecture
Number of hours:
per week: 2 / 2 **per level/semester:** 28 / 28
Form of the course: on-site learning

Type, volume, methods and workload of the student - additional information
Form of Study: lecture / practical
Number of contact 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.

Prerequisites:

Course requirements:
Only students who have attended the exercises and passed them after a written exam with a minimum rating of E can pass the exam. The course has a standardized evaluating (grading) system: Grade A (100-92 %); B (91-84 %); C (83-76 %); D (75-68 %); E (67-60 %); FX (59-0 %).

Learning outcomes:
The course will provide students with basic knowledge of general virology, ie. j. on the structure, replication, pathogenesis, and ecology of viral diseases as well as on molecular biology of viral propagation and genetics of viruses. The exercise will enable students to acquire basic skills in the virological laboratory.

Class syllabus:
Significant milestones in the history of virology. Position of viruses in the system of living matter, the principle of viral intracellular parasitism. Structure of viruses, symmetry of viral capsid. Phases of virus replication in infected cell, eclipsis characterization. Virus-cell interaction, productive, persistent, and latent virus infection, transformation of cells by viruses and tumours. Genetics of viruses, viral mutants, recombination, complementation, phenotype mixing. DNA viruses, cell replication and transformation. RNA virus replication. Retroviruses, transformation mechanisms. Basics of pathogenesis of viral infections. Basics of virus ecology. Transposons, retrotransposons, viroids, prions, replication mechanisms.

Recommended literature:
N. J. Dimmock A. J. Easton K. N. Leppard: N. J. Dimmock A. J. Easton K. N. Leppard: Introduction to modern virology, ISBN 978-1-119-97810-7 Fields Virology, ISBN-10: 1-4511-0563-0
Korsman et al., Virology an illustrated colour text, ISBN 9780443073670

Golais F.: Cellular Virology. 2021. Publishes by Comenius University in Bratislava, ISBN 978-80-223-5342-7.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 33

A	B	C	D	E	FX
6,06	21,21	21,21	21,21	12,12	18,18

Lecturers: doc. RNDr. Tatiana Betáková, DrSc., doc. RNDr. Peter Kabát, CSc., PhDr. Eva Nováková

Last change: 12.09.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-107/22	Winter Physical-Education Training

Educational activities:
Type of activities: training session
Number of hours:
per week: **per level/semester:** 5d
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3., 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 231

A	B	C	D	E	FX
62,77	0,0	0,0	0,0	0,0	37,23

Lecturers: PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, Mgr. Kristína Vanýsková

Last change: 01.08.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Natural Sciences

Course ID:	**Course title:**
PriF.KTV/N-bXTV-109/22	Ďumbier mountain hiking

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

Number of credits: 1

Recommended semester: 1., 3., 5.

Educational level: I.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 303

A	B	C	D	E	FX
64,69	0,0	0,0	0,0	0,0	35,31

Lecturers: PaedDr. Vladimír Hubka, Mgr. Miriam Kirchmayerová, PhD., Mgr. Martin Mokošák, PhD., Mgr. Igor Remák, PhD., PaedDr. Mgr. Lenka Vandáková, Mgr. Kristína Vanýsková, Mgr. Denisa Strečanská

Last change: 01.08.2022

Approved by: