Course descriptions

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COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-251/22	Accelerator Analytical Methods

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 0

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

Lecturers: doc. RNDr. Miroslav Ješkovský, PhD., Mgr. Jakub Zeman, PhD.

Last change:

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-204/22	Applied Nuclear Physics

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

Number of credits: 5

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
A student may earn 20% per semester for completing the course assignment and its presentation, and the final written exam is weighted at 80%. A student must earn at least half of the points on the course assignment and its presentation to pass the final written exam. The student must also score at least 41 points on the final written examination.
Grades: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), FX (50-0).
Mid-term / final assessment weighting: 20% intermediate grade (for the assignment and its presentation) / 80% final written exam.
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students will learn the basic concepts and methods of ionizing radiation dosimetry. They will gain knowledge of the use of radionuclide sources and particle beams in industry and medicine. They will become familiar with special analytical methods.

Class syllabus:
1. Basic dosimetric quantities and relationships between them. Absolute methods for measuring activity and dose.
2. Radiative equilibrium, Fano's theorem.
3. Bragg-Gray cavity theory. Ionization methods of dosimetry.
4. Integral dosimetry methods, film and thermoluminescence dosimeters, track detectors.
5. Microdosimetric models of radiation damage. Biological effects of ionizing radiation.
6. Radionuclide radiation sources and accelerators. PIG and ECR ion sources.
7. Methods for the complete identification of charged particles. Bragg spectrometers.
8. Special methods of elemental and isotopic analysis: CPAA, NRM, RBS, ERD, TLA, XRF, etc.
9. Radioactive dating methods and their applications in geology.
10. Industrial non-destructive testing and sterilization methods. Effect of particle beams on corrosion and mechanical properties of materials.
11. Production of radioisotopes in accelerators and their use in diagnosis and therapy of diseases.
12. Imaging and therapeutic methods.
13. Apparatuses and devices based on radiation sources.

Recommended literature:

Chudý M.: Základy dozimetrie žiarenia. (Učebné texty-Multimediálny program vzdelávania v oblasti ionizujúceho žiarenia a radiačnej ochrany- ved. K. Holý), KJFB FMFI UK, Bratislava, 2008.
Holá O., Holý K.: Radiačná ochrana : Ionizujúce žiarenie, jeho účinky a ochrana pred ionizujúcim žiarením. - 1. vyd. - Bratislava : Slovenská technická univerzita, 2010.
Shani G.: Radiation Dosimetry: Instrumentation and Methods (-2nd ed). CRC Press, 2001
Mook W. G.: Isotopes in the Hydrological Cycle, IAEA Vienna, 2000
White W. M.: Isotope Geochemistry. Wiley-Blackwell, 2015, 496 s.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 43

A	B	C	D	E	FX
46,51	27,91	11,63	6,98	4,65	2,33

Lecturers: doc. RNDr. Radoslav Böhm, PhD., doc. RNDr. Monika Müllerová, PhD., Mgr. Ivan Kontuľ, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-957/15	**Course title:** Applied Nuclear Physics
Number of credits: 2	
Educational level: II.	
State exam syllabus:	
Last change: 02.06.2015	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-133/23	Artificial Intelligence for Everyone

Educational activities:
Type of activities: training session / course
Number of hours:
per week: 9 **per level/semester:** 1t / 117
Form of the course: on-site learning

Number of credits: 6

Recommended semester:

Educational level: 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: 22

A	B	C	D	E	FX
45,45	36,36	4,55	9,09	4,55	0,0

Lecturers: prof. Ing. Igor Farkaš, Dr.

Last change:

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-236/00	Detection Methods in High Energy Physics

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
The course will cover the physics of particle detectors. It will introduce the experimental techniques used in nuclear, particle physics and photon science, and describe the layout and functionality of modern experiments.

Class syllabus:
1. Introductions to instruments for high-energy physics
2. Interaction of Particles with Matter
3. Gaseous detectors
4. Scintillators detectors
5. Solid state detectors
6. Detectors using transition radiation
7. Readout electronics
8. Tracking
9. EM and Hadron calorimeters
10. Particle identifications
11. Complex detector systems
12. Detectors of high energy particles in space research

Recommended literature:
C. Grupen, B. Shwartz, Particle Detectors, Cambridge University Press, 2011, s. 676
C. Grupen,, I.Buvat, Handbook of particle detection and imaging, vol. 1 and vol.2, Springer, 2012, s. 1227
S. Biswas, S. Das, S. K. Ghosh, Advanced Detectors for Nuclear, High Energy and Astroparticle Physics, Springer, 2018, s. 229

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 46

A	B	C	D	E	FX
69,57	21,74	4,35	4,35	0,0	0,0

Lecturers: doc. Mgr. Michal Mereš, PhD., doc. RNDr. Tibor Ženiš, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Student works according to instructions given by his/her diploma supervisor.

Recommended literature:
Recommended by diploma supervisor.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 93

A	B	C	D	E	FX
91,4	4,3	4,3	0,0	0,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-911/00	Diploma Thesis (2)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 5 **per level/semester:** 65
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Student works according to instructions given by his/her diploma supervisor.

Recommended literature:
Recommended by diploma supervisor.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 87

A	B	C	D	E	FX
90,8	4,6	4,6	0,0	0,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-912/22	Diploma Thesis (3)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 5 **per level/semester:** 65
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Student works according to instructions given by his/her diploma supervisor.

Recommended literature:
Recommended by diploma supervisor.

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: prof. RNDr. Jozef Masarik, DrSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-991/16	**Course title:** Diploma Thesis Defense
Number of credits: 16	
Educational level: II.	
State exam syllabus:	
Last change:	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-920/00	Diploma Thesis Seminar (1)

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

Number of credits: 1

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
The first public presentation of the diploma thesis, formulation of the aims of the diploma thesis and the chosen way of realisation. Concluding analysis of the seminar talk.
Methodical advancement at the preparation of the structure and duration of the given seminar thesis, the use of references and possible ways to obtain needed informations.

Recommended literature:
According to the given diploma thesis.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 93

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

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-921/00	Diploma Thesis Seminar (2)

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

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Common principles how to write a scientific particle, particulary a diploma thesis. Graifcal arrangement, segmentation, correct use of references etc. Seminar talk in a given time-frame, the use of different techniques at presentation. Concluding evaluation of the presented talk.

Recommended literature:
According to the given diploma thesis.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 89

A	B	C	D	E	FX
98,88	0,0	0,0	0,0	1,12	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-922/00	Diploma Thesis Seminar (3)

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

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
To prepare the diploma thesis in the form, which is commonly used for this type of scintific publications. Analyses of the diploma thesis presentation, reccomendations for eventual corrections, modifications and structure of the text, figure and table insertion and conformity with the text etc.
Common principles and reccomendations to present the diploma thesis at the session of the examiantion cometee in 15 – 20 min time limit.

Recommended literature:
The given diploma thesis.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 88

A	B	C	D	E	FX
98,86	0,0	0,0	0,0	1,14	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-103/22	Elementary Particle Physics

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

Number of credits: 5

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Mastering basic knowledge from phenomenology of elementary particle physics. After completing this subject, the student will be able to analyze experimental results, realize basic calculations and apply experimental methodologies in subnuclear physics.

Class syllabus:
1. Decay rates and effective cross-sections
2. Dirac equation and spin
3. Exchange interactions
4. Electron positron annotation
5. Electron scattering on the proton and deep inelastic scattering
6. Symmetries and quark model
7. QCD and color
8. V-A currents and weak interactions
9. Leptonic weak interactions
10. Neutrino and neutrino oscillations
11. CKM matrix and CP symmetry
12. Electroweak unification and W and Z Boson
13. Higgs boson and particle physics behind the standard mode

Recommended literature:
B.R. Martin a G. Shaw, Particle physics, John Wiley & Sons Inc, (2017), P. 480.
D. Griffiths, Introduction to elementary particle physics, Wiley-VCH Verlag GmbH, (2008), P. 470.
G. Kane, Modern elementary particle physics, Cambridge University Press, (2017), P. 240.

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 46

A	B	C	D	E	FX
73,91	15,22	6,52	4,35	0,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc., doc. Mgr. Pavol Bartoš, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: II.

Prerequisites:

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

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

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

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

Languages necessary to complete the course:
Slovak or English

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

Past grade distribution
Total number of evaluated students: 95

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

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: II.

Prerequisites:

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

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

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

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

Languages necessary to complete the course:
Slovak or English

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

Past grade distribution
Total number of evaluated students: 95

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

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 3., 7., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 291

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

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 4., 8., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-114/15	Experimental Methods in Nuclear Physics (1)

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

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Exam: written and oral exam, successful completion of the written part is condition for the oral part. Share in the overall rating: 80/20.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
To provide students with basic information about the interaction of charged particles and photons with different energies with the material environment.
Explain the physical principles of operation of detectors designed for registration and identification of nuclear radiation, elementary particles and heavy ions

Class syllabus:
Interaction of charged particles, neutrons and gamma radiation with the material environment. Elastic scattering. Rutherford and Mott formulas. Electron scattering, Radiation braking. Ionization and arousal. Bethe-Bloch formula. Ionization energy losses. Particle range. Delta electrons. Fluctuations in ionization losses. Cherenkov radiation. Transient radiation. Interaction of photons with matter. High energy interactions. Principles of operation of gas detectors. Ionization chambers, proportional, G-M, corona and spark detectors. Scintillation and semiconductor detectors.

Recommended literature:
G.F. Knoll: Radiation Detection and Measurement, John Wiley & Sons, 2000
W. R. Leo, Techniques for nuclear and particle physics, Springer Verlag, Berlin, 1996
K. Kleinknecht, Detectors for particle radiation, Cambridge University Press, 1998
S. Usačev a kol., Experimentálna jadrová fyzika, ALFA-SNTL, Bratislava 1982
Š. Šáro, Detekcia a spektrometria žiarenia alfa a beta. Alfa, Bratislava, 1983
V. V. Balashov, Interaction of Particles and Radiation with Matter, Springer Verlag Berlin Heidelberg, 1997, 238p, ISBN3-540-60871-0
N. J. Carron, An Introduction to the Passage of Energetic Particles through Matter, CRC Press,Taylor&Francis Group, 2007, ISBN-10:0-7503-0935-0

Languages necessary to complete the course:

slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 47

A	B	C	D	E	FX
19,15	23,4	31,91	14,89	10,64	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., Mgr. Ivan Kontuľ, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-105/00	Experimental Methods in Nuclear Physics (2)

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
After completing the course, students will have knowledge of nuclear spectrometry methods and their application in the use of radionuclides.

Class syllabus:
Specifics of the nuclear physics measurements, the base structure of the measuring equipment, the detector response function, energy resolution (limits, Fano factor), time characteristics (pile-up, the spectrum distortion). Magnetic methods of spectrometry, using magnetic field to separation of particle beam, the magnetic field focusation, the classification of the spectrometers. Ionization methods of charge particles spectrometry, ionization chamber with grid, principles of using the proportional counters, semiconductors detectors in the spectrometry, detectors with compensation and HPGe detectors. Scintillation spectrometry methods, treating of instrumental spectra, peak efficiency, multiple detectors gamma-ray spectrometry. The high resolution spectrometer electronic circuits scheme. The liquid scintillation spectrometry applications (3H a 14C analysis). Applications scintillations methods in radionuclide diagnostics (gammagraphic methods and PET, principles of imaging using the thin scintillator)

Recommended literature:
Usačev S., a kol.: Experimentálna jadrová fyzika, ALFA Bratislava, 1982
Abramov A. I.: Osnovy experimentalnych metodov jadernoj fyziky, Atmizdat Moskva 1980
W.R. Leo, Techniques for nuclear and particle physics, Springer Verlag, Berlin, 1996
K. Debertin and R.G. Helmer: Gamma-and X-ray spectrometry with semiconductor detctors, North-Holland, Amsterdam, 1988

Languages necessary to complete the course:

slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 89

A	B	C	D	E	FX
33,71	20,22	22,47	16,85	4,49	2,25

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

Last change: 17.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-956/15	**Course title:** Experimental Methods in Nuclear and Subnuclear Physics
Number of credits: 2	
Educational level: II.	
State exam syllabus:	
Last change: 02.06.2015	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-136/00	Feynman Diagrams

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Particle scattering on potential in quantum mechanics, relativistic equations and their propagators, scattering of electron and positon on potential field, intercations of electrons, muons and photons, second approach to Feynman diagram – quntum field theory.

Recommended literature:
J. Pišút, Introduction to Feynam diagrams, Study texts UK Bratislava, (1984) (in Slovak)
J.D. Bjorken, S.D. Drell, Relativistc quantum mechanics, McGraw-Hill, New York, (1976)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 32

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

Lecturers: prof. RNDr. Jozef Masarik, DrSc.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 482

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 307

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 120

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 79

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 828

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 541

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 184

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 104

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-222/22	High Energy Physics

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

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: homeworks
Final assessment: in case of no homeworks received, written exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students achieve basic knowledge about electromagnetic, weak, and strong interactions. Basic deep inelastic scattering processes are analyzed – electron-muon scattering, elastic and inelastic electron-proton scattering. The course covers higher order corrections, renormalisation and introduction to quantum chromodynamics, including evolution equations for quark and gluon densities. The basic weak processes, violation of C, P and CP-parity, and basics of Standard model are discussed.

Class syllabus:
1. Basic concept of the elementary particle physics.
2. Strong interactions – qualitative overview, colour SU(3) symmetry
3. Classification of hadrons – multiplets of hadrons.
4. Spin 0 particles. Electrodynamics of spin 0 particles, amplitudes and cross-sections.
5. Spin ½ particles. Electrodynamics of spin ½ particles, comparison with spin 0 particles.
6. Field as a physical system, quantization, bosons vs fermions.
7. Propagators, virtual particles. Green function vs propagator.
8. Second order of perturbative theory, renormalisation, running coupling constant.
9. Parton model, compositeness of particles, form factors.
10. Basics of quantum chromodynamics, evolution of quark gluon densities – DGLAP.
11. Weak interactions – muon decay, C and P violation. Oscillations of neutral K-, D-, B- mesons.
12. Electroweak unification, calibration symmetries, spontaneous symmetry breaking, Standard model.
13. Top quark physics. Higgs boson and a new physics beyond Standard model.

Recommended literature:
Introduction to elementary particles / David Griffiths. Weinheim : Wiley-VCH, 2008

Quarks and leptons:An introductory course in modern particle physics / F. Halzen, A.D. Martin: John Wiley, 1984
Particles and Quantum Fields / Hagen Kleinert: World Scientific Publishing Co. Pte. Ltd., 2016

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 40

A	B	C	D	E	FX
30,0	25,0	25,0	10,0	7,5	2,5

Lecturers: prof. RNDr. Stanislav Tokár, DrSc., doc. Mgr. Pavol Bartoš, PhD., Mgr. Barbora Eckerová, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 5

Recommended semester: 1., 7.

Educational level: II.

Prerequisites:

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

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

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

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

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

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 8

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

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

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FOZ-203/10	Isotope Methods in Environmental Physics

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

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
A student can earn 30% per semester for the course project and its presentation, and the final written exam is weighted at 70%. A student must earn at least half of the points for the project to pass the final written examination. The student must also score at least 36 points on the final written examination.
Grades: A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), FX (50-0).
Mid-term / final assessment weighting: 30% mid-term assessment (project + presentation) / 70% final written exam.
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
By completing the course, the student will gain a comprehensive knowledge of the applications of stable and radioactive isotopes in the monitoring and study of environmental processes.

Class syllabus:
Stable isotopes: 1. Properties of ecologically significant stable isotopes. 2. Physico-chemical basis of isotope fractionation. Isotope delta notation. 3. Stable isotopes of hydrogen, carbon and oxygen. Meteoric water line. 4. Isotope fractionation in open and closed systems. 5. Use of isotopes as tracers of pollution, species migration and in medicine. 6.The role of isotopes in the observation of global climate change.
Radioactive isotopes: 7. Physical basis of radionuclide applications. 8. Origin and properties of environmentally important radionuclides. 9. Radionuclides as tracers of atmospheric processes. 10. Use of radionuclides in hydrology and geology. 11. Radionuclide dating. 12. Methods of measurement of stable and radioactive isotopes. 13. International isotope standards.

Recommended literature:
B. Fry: Stable Isotope Ecology. Springer Science, (2006), 308 p.
R. E. Criss: Principles of Stable Isotope Distribution. Oxford Univesity Press, (1999), 254 p.
Mook W. G.: Isotopes in the Hydrological Cycle, IAEA Vienna, 2000
Froehlich K. (editor): Environmental Radionuclides: Tracers and Timers of Terrestrial Processes, Elsevier, 2010

Baskaran M.: Radon: A Tracer for Geological, Geophysical and Geochemical Studies, Springer, 2016

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

Notes:

Past grade distribution
Total number of evaluated students: 31

A	B	C	D	E	FX
41,94	12,9	22,58	9,68	12,9	0,0

Lecturers: RNDr. Martin Bulko, PhD., doc. RNDr. Monika Müllerová, PhD., Ing. Jakub Kaizer, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-142/15	Methods in Nuclear Structure Studies

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during the semester: midterm test
Final evaluation: oral exam
Scale for final grades: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
The student gains an understanding of the structure of atomic nuclei and possibilities for its study. Acquired knowledge allows the student to estimate and evaluate the nuclear structure properties from the experimental data obtained in the decay-spectroscopy measurements.

Class syllabus:
Spherical and deformed shell model. Influence of the nuclear structure on the radioactive decay. Excited states and the deexcitation of atomic nuclei, acquiring the nuclear data from the conversion-electron and gamma spectroscopy. Isomeric states in spherical and deformed nuclei. Multi-quasiparticle K isomeric states. Collective excitations. In-beam spectroscopy. Detection of nuclear fission fragments. Decay spectroscopy and separation of reaction products. Radioactive-ion beam. Laser spectroscopy. Data analysis, statistical analysis and evaluation of basic properties for atomic nuclei from experimental data.

Recommended literature:
Introductory nuclear physics / Kenneth S. Krane. Hoboken : Wiley, 1988
Introductory nuclear physics / P. E. Hodgson, E. Gadioli, E. Gadioli Erba. Oxford : Oxford University Press, 1997
Nuclear structure from a simple perspective / R. F. Casten. Oxford : Oxford University Press, 2000

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 32					
A	B	C	D	E	FX
75,0	6,25	6,25	3,13	9,38	0,0
Lecturers: doc. Mgr. Stanislav Antalic, PhD., Mgr. Boris Andel, PhD.					
Last change: 21.06.2022					
Approved by: prof. RNDr. Jozef Masarik, DrSc.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-125/00	Modelling Experimental Set-Ups

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Students will understand how to model random variables in general, and how to apply the general principles to the task of simulating interaction of particles with material. They will gain basic understanding of probability theory, estimators and hypothesis testing. They will learn how to use machine learning models to solve classification problems in physics and how to use unfolding to estimate true distributions from observations smeared by experimental measurement.

Class syllabus:
1. Introduction to C++ and ROOT software.
2. Introduction to probability theory and statistics. Uncertainty propagation, Central Limit Theorem.
3. Random distributions occuring in physics, computer-based random number generation.
4. Estimators, statistical tests, estimation of confidence intervals.
5. Stochastic processes and Markov chains.
6. Modelling of particle interaction with material and the transport equation.
7. Introduction to Bayesian statistics and Fisher discriminant.
8. p-value and statistical significance of a measurement.
9. Machine learning and its application for signal/background classification in physics.
10. Deconvolution (unfolding). Issues with a naive approach to unfolding. Parametrized unfolding approach.
11. Hypothesis testing. Quantification of agreement of data and a model. Chi-square and likelihood approaches.
12. Maximum likelihood fit and uncertainties estimation.

Recommended literature:

Data Analysis in High Energy Physics: A Practical Guide to Statistical Methods, Olaf Behnke, Kevin Kröninger, Grégory Schott, and Thomas Schörner-Sadenius, 2013
Statistics, a guide to the use of statistical methods in the physical sciences, R. J. Barlow, John Wiley and Sons, 1989
Introduction to Statistics and Data Analysis for Physicists, Gerhard Bohm, Günter Zech, 2010

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 40

A	B	C	D	E	FX
87,5	5,0	5,0	0,0	0,0	2,5

Lecturers: prof. RNDr. Stanislav Tokár, DrSc., Mgr. Michal Dubovský, PhD.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-249/16	Modelling of Radiation Interaction with Matter

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

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Semestral project, oral examination
Approximate grade thresholds: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 5

A	B	C	D	E	FX
60,0	0,0	40,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Tibor Ženiš, PhD., doc. Mgr. Róbert Breier, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-153/22	Neutrino Physics

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
quantum mechanics, quantum field theory

Course requirements:
preliminary evaluation: -; final evaluation: test plus oral exam
The scale of assessment (preliminary/final): 0/100

Learning outcomes:
By addressing the urgent tasks of neutrino physics, students will gain the knowledge and understanding of the evolution of the Universe, processes in stars, nuclear reactors, Earth's atmosphere, and core, as well as about the formulation of the Grand Unified Theories.

Class syllabus:
1. Brief History of the Neutrino
2. Neutrino within the Standard Model, Neutrino Interactions
3. Neutrino Scattering Theory
4. Natural Neutrino Sources (Sun, Atmosphere, Earth, Cosmic Accelerators, Supernova)
5. Artificial Neutrino Sources (Accelerators, Reactors)
6. Physics Beyond the SM: Neutrino Masses and Mixing, See-Saw Mechanism
7. Neutrino Oscillations in Vaccum
8. Neutrino Oscillations in Matter (MSW)
9. Solar, atmpheric, accelerator and reactor neutrino oscillations
10. Laboratory Experiments to directly measure Neutrino Mass
11. Lepton Flavor/Number Non-conservation, Neutrinoless Double Beta Decay
12. Neutrino Cosmology, Relic Neutrinos
13. Sterile Neutrinos

Recommended literature:
Zhi-Zhong Xing and Shun Zhuo: Neutrinos in Particle Physics, Astronomy and Cosmology, Springer, 2010
Samoil Bilenky: Introduction to the Physics of Massive and Mixed Neutrinos, Springer, 2010

Frank F. Deppisch: A modern Introduction to Neutrino Physics, Morgan & Claypool Publishers, 2019

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 12

A	B	C	D	E	FX
58,33	41,67	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Fedor Šimkovic, CSc., Mgr. Eliška Eckerová, PhD., Mgr. Zuzana Bardačová, PhD.

Last change: 28.02.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-221/15	Neutron Physics and Reactor Systems

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

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
75,86	10,34	10,34	0,0	0,0	3,45

Lecturers: doc. RNDr. Miroslav Ješkovský, PhD., Mgr. Jakub Zeman, PhD.

Last change: 17.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-152/22	New Trends in Particle Detection and Spectrometry

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous evaluation - written test, final evaluation - oral exam, evaluation scale (in %): A (100-91), B (90-81), C (80-71), D (70-61), E (60-51)
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
To inform students about the latest trends in particle detection and new spectrometric systems. After completing this course, the students will gain the latest knowledge from domestic and foreign research in the field of experimental methods of nuclear physics.

Class syllabus:
1. Main phases in development of ionization radiation detectors.
2. New semiconductor detectors
3. Cryogenic detectors
4. Superconducting detectors
5. Ultra-low-background detectors
6. Detectors for astroparticle reasearch
7. Time-of-flight detectors
8. In situ gamma spectrometry underground and underwater
9. Accelerator mass spectrometry
10. Plasma spectrometry
11. Thermal ionization spectrometry
12. Laser spectrometry and spectrometry of secondary ions
13. Ion trap spectrometry

Recommended literature:
Michael F. L'Annunziata (ed:): Handbook of Radioactivity Analysis, Academic Press, 2020.
A.K. Batra: Advanced Nuclear Radiation Detectors, Iop Publishing Ltd, London, 2021, 225s.
M.S. Lee: Mass Spectrometry Handbook, Wiley, New York, 2012, 1300s.
Review articles in scientific journals and conference proceedings.

Languages necessary to complete the course:

Slovak or 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: Mgr. Ivan Kontuľ, PhD., prof. RNDr. Pavel Povinec, DrSc.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-122/22	Nuclear Electronics

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

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:
Mastering the knowledge of electronic elements with regard to their use in the instruments of nuclear-physical experiment. After completing this course, the student will know the electronic elements, their use in processing of signal of ionizing radiation detectors.

Class syllabus:
The syllabus of the subject:
1. Introduction to the nuclear electronics. Measurement of electrical quantities.
2. Analysis of electronic circuits. Solution of linear circuits.
3. Signal and signal shaping.
4. Semiconductor diode.
5. Bipolar and unipolar transistor.
6. Transistor configurations.
7. Ionizing radiation detector and its equivalent circuit.
8. Amplifier and preamplifier.
9. Signal amplitude analysis.
10. Analysis of time information.
11. Logical circuits.
12. Digital signal processing.
13. Standardization of measuring apparatus.

Recommended literature:
D. Kollár: Elektronika a automatizácia. (Základy jadrovej elektroniky I.) Skriptá MFF UK 1990
Jeremiah Mans: Electronics for Experimenters. University of Minnesota 2011
Adel S. Sedra, Kenneth C.(KC) Smith, Tony Chan Carusone, and Vincent Gaudet: Microelectronic Circuits. Oxford University Press 2019

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 93					
A	B	C	D	E	FX
40,86	29,03	18,28	6,45	2,15	3,23
Lecturers: doc. RNDr. Tibor Ženiš, PhD., doc. Mgr. Róbert Breier, PhD.					
Last change: 20.06.2022					
Approved by: prof. RNDr. Jozef Masarik, DrSc.					

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-133/15	Nuclear Energetics

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

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Final assessment: oral examination.
Grading: (%): A (100-91), B (90-81), C (80-71), D (70-61), E (60-51), FX (50-0)
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
By completing the subject, students will gain knowledge about the principles of nuclear energy and other energy sources, their impact on the environment and the current energy situation in Slovakia and in the world.

Class syllabus:
1. Energetics and environment
2. Renewable and non-renewable energy sources
3. Price and production of electricity
4. Anthropogenic radionuclides and their sources
5. Sources of radiation in nuclear power plant
6. Radiation protection in NPP
7. Physical basics of a nuclear reactor and types of reactors
8. Fuel cycle
9. Radioactive wastes and their treatment
10. Safety of nuclear power plant operation
11. Nuclear power plant accidents and their environmental impact
12. Monitoring of anthropogenic radioactivity
13. Nuclear energetics in Slovakia and in the world

Recommended literature:
[1] O. Holá a K. Holý, Radiačná ochrana – ionizujúce žiarenie, jeho účinky a ochrana pred ionizujúcim žiarením, STU Bratislava, (2010), S. 200.
[2] D. Bodansky, Nuclear energy - principles, practices, and prospects, Springer, (2004), S. 701.
[3] R. L. Murray, Nuclear Energy - An Introduction to the Concepts, Systems, and Applications of Nuclear Processes, Butterworth-Heinemann (Elsevier), (2009), S. 519.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 13

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

Lecturers: Ing. Jakub Kaizer, PhD., Mgr. Ivan Kontuľ, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-138/00	Nuclear Geophysics and Astrophysics

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
To point to the application of nuclear-physical knowledge in the field of astrophysics and cosmology, as well as to the interconnectedness of these disciplines and to teach basic knowledge about the production of applications of cosmogenic and primordial nuclides.

Class syllabus:
1. Big Bang and Nucleosynthesis
2. r and with processes,
3. The formation of the megastructure of the universe,
4. formation of the solar system,
5. Meteorites - their origin, properties,
6. The inner and outer planets of the solar system,
7. Cosmic radiation,
8. Nuclear reactions of cosmic radiation
9. Production of cosmogenic nuclides in extraterrestial objects,
10. the production of cosmogenic nuclides in the Earth's atmosphere,
11. in situ production of cosmogenic nuclides.
12. Isotopic dating methods

Recommended literature:
Cosmic rays and particle physics by Thomas K. Gaisser. Cambridge : Cambridge University Press, 1992
Theoretical astrophysics : Volume 1 : Astrophysical processes / T. Padmanabhan. Cambridge : Cambridge University Press, 2000

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 39

A	B	C	D	E	FX
66,67	23,08	5,13	5,13	0,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc., doc. Mgr. Róbert Breier, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-958/15	**Course title:** Nuclear Physics
Number of credits: 2	
Educational level: II.	
State exam syllabus:	
Last change: 02.06.2015	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-202/22	Nuclear Reactions

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

Number of credits: 5

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during the semester: midterm test
Final evaluation: oral exam
Scale for final grades: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
The student gains an understanding of nuclear reactions and their properties. Acquired knowledge allows the student to estimate and evaluate the production yield of nuclear reaction and their kinematic properties. The student will be also able to estimate and suggest a suitable experimental base to solve various questions in the field of nuclear physics.

Class syllabus:
General principles of nuclear reactions (NRs), reaction kinematics, the role of orbital momentum, rotational potential, types of NRs, reaction cross-section, elastic and inelastic scattering, neutron-induced NRs, nucleon transfer reactions, deep inelastic reactions, optical model, reactions of gamma quanta, compound nucleus reactions, heavy-ion reactions, fission reactions, applications of NRs, thermonuclear reactions, synthesis of superheavy nuclei, nuclear reactions at relativistic energies.

Recommended literature:
Introduction to nuclear reactions / Carlos A. Bertulani, Pawel Danielewicz. Bristol : Institute of Physics Publishing, 2004
Introductory nuclear physics / Kenneth S. Krane. Hoboken : Wiley, 1988
Introductory nuclear physics / P. E. Hodgson, E. Gadioli, E. Gadioli Erba. Oxford : Oxford University Press, 1997

Languages necessary to complete the course:

Notes:

Past grade distribution Total number of evaluated students: 95					
A	B	C	D	E	FX
55,79	20,0	15,79	5,26	3,16	0,0
Lecturers: doc. Mgr. Stanislav Antalic, PhD., Mgr. Boris Andel, PhD.					
Last change: 21.06.2022					
Approved by: prof. RNDr. Jozef Masarik, DrSc.					

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-955/15	**Course title:** Nuclear and Subnuclear Physics
Number of credits: 2	
Educational level: II.	
State exam syllabus:	
Last change: 02.06.2015	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-107/00	Nucleus Theory

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
History and success of nuclear physics, basic characteristics of nucleus (mass, dimension, spin, magnetic and electric moments, quadrupole moments, nuclear deformation), models of strong interacting particles (drop model, nuclear matter, nuclear stars), models of independent particles (Fermi model), nuclear shell model (harmonic oscillator potential, Woods-Saxon potential, spin-orbit interaction), generalized models
(single particle states in non-sphericals – Nilsson model, roational bands, vibrational states, resonances), optical model, Pauli exclusion principle and isospin, Nucleon-nucleon interaction, phase analysis of scattering angles, two-particle wave function, deuteron, nuclear Hamiltonian, microscopical models (Hartree and Hartree-Fock methods), nuclear interactions (alpha, beta and gamma nuclear transitions).

Recommended literature:
T. Mayer-Kuckuk: Fyzika atómového jádra, SNTL, Praha, 1979,
J.M.Eisenberg, W.Greiner: Nuclear Theory

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
55,56	31,11	10,0	1,11	2,22	0,0

Lecturers: prof. RNDr. Fedor Šimkovic, CSc., Mgr. Rastislav Dvornický, PhD.

Last change: 02.06.2015

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-132/00	Particle Accelerators

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

Number of credits: 3

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Examination: written test / oral examination, 70/30
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
The course will cover the physics of particle accelerators. It will introduce the techniques used in particle accelerators, and describe the layout and functionality of modern accelerators and acceleration systems.

Class syllabus:
1. Linear accelerators – electrostatic, Linear resonant accelerators
2. Linear accelerators of relativistic particles, Resonators
3. Accelerators with running and standing wave, Principe of self-phasing
4. Cyclic accelerators – Cyclotron, Phazotron
5. Relativistic isochronic cyclotron, Microtron, Betatron
6. Stationary trajectory of accelerator
7. Synchrotron, Synchrophazotron
8. Weak and Strong focusation
9. Equation of motion for particle in acceleration
10. Compactness of beam momentum, Criterion of stability
11. Fix target accelerators
12. Quality and cooling of beam

Recommended literature:
E. Wilson, An Introduction to Particle Accelerators, Oxford Univ. Press, 2001, s. 252
K. Wille, The Physics of Particle Accelerators : An Introduction, Oxford University Press, 2001, s. 330
S. Bernal, A Practical Introduction to Beam Physics and Particle Accelerators, Morgan & Claypool Publishers, 2016,

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 89

A	B	C	D	E	FX
55,06	28,09	15,73	0,0	0,0	1,12

Lecturers: doc. Mgr. Michal Mereš, PhD., doc. Mgr. Pavol Bartoš, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1911

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1797

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1454

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1267

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-115/22	Physics of the Atomic Nucleus

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

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during the semester: midterm test
Final evaluation: oral exam
Scale for final grades: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
The student gains the understanding of the physics of atomic nuclei, their basic theoretical description and properties of radioactive decays. Acquired knowledge allows the student to estimate and evaluate the basic properties of atomic nuclei and extract the information from the data obtained in the experiments.

Class syllabus:
Summary of basic nuclear models and nuclear potential. Spherical and deformed shell model. Deformation of the nucleus and its collective excitation. Radioactive decay (Q value, selection rules, hindrance factors). The excited state of nuclei, gamma transition, internal conversion. The nuclear fission process (fission barrier, spontaneous and induced fission). Nuclear isomers. Detection of emitted particles.

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 47

A	B	C	D	E	FX
78,72	6,38	8,51	0,0	6,38	0,0

Lecturers: doc. Mgr. Stanislav Antalic, PhD., Mgr. Boris Andel, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-106/22	Practical Exercises in Nuclear Physics and Electronics

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

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous evaluation: evaluation of submitted laboratory protocols.
Evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Acquiring experimental experience with ionizing radiation detectors and relevant electronic apparatus. Students should familiarize themselves with processes connected to absorption of ionizing radiation in matter and use the acquired knowledge and experience to identify unknown radioactive sources. The aim is also to verify the properties of basic electronic circuits and components used in nuclear physics experiments.

Class syllabus:
Nuclear Physics:
1. Detectors and measurement apparatus for activity and energy measurements.
2. Specific energy losses of alpha particles.
3. Determination of maximum beta particle energy.
4. Absorption of gamma radiation.
5. Identification of an unknown radioactive source.
Electronics:
1. Verification of Ohm's Law.
2. Diode and Zener diode.
3. Integrator and differentiator.
4. Bipolar junction transistor.

Recommended literature:
D. Kollár, Praktikum z elektroniky a automatizácie, Univerzita Komenského, 1991, s. 182
M. Florek, Praktikum z jadrovej fyziky a elektroniky, Univerzita Komenského, 1990, s. 202
http://www.dnp.fmph.uniba.sk/~kollar/jewww/index_je.htm
http://www.dnp.fmph.uniba.sk/~kollar/p4_www/index_p4.htm

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 94

A	B	C	D	E	FX
77,66	21,28	1,06	0,0	0,0	0,0

Lecturers: Mgr. Ivan Kontuľ, PhD., doc. Mgr. Róbert Breier, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-121/22	Processing of Nuclear Physics Data

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

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Exam: written and oral exam, successful completion of the written part is condition of the oral part.
Share in overall rating: 80/20.
Indicative rating scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, students will gain knowledge of statistical methods of processing and evaluation of experimental data and master the basics of theory and use of numerical methods of nuclear physics.

Class syllabus:
Data description, theoretical distributions, uncertainties, estimates - plausibility function, basic estimators, maximum likelihood method, moment method, least squares method, $\chi 2$ distribution, $\chi 2$ distribution check. Probability and reliability - basic concepts, mathematical probability, Bayesian statistics, confidence level, binomial confidence interval, Poisson confidence interval. Decision making - hypothesis testing, (significance, force function, Neymanov Pearson's test) - interpretation of experiments, null hypothesis, binomial probabilities, goodness of fit test, $\chi 2$ test, run test, Kolmogorov test, two-sample problem, paired and correlated samples, F distribution . Accuracy of calculations, error propagation, interpolation, extrapolation, approximation of functions, solution of systems of linear equations, integration of functions, search for local extrema of functions, random numbers, sorting, Fourier transform, ordinary differential equations

Recommended literature:
L. Kubáčková, Metódy spracovania experimentálnych údajov, Veda, Bratislava, 1990
R. Barlow, Statistics (A Guide to the Use of Statistical Methods in the Physical Sciences), John Wiley&Sons, Chichester, England, 1999 (Manchester physics series)
G. Covan, Statistical Data Analysis, Clarendon Press, Oxford, 1998 (Oxford Physics series)
H. M. Antia, Numerical Methods for Scientists and Engineers, , Basel: Birkhäuser, 2002
W. H. Press, Numerical Recipes, , Cambridge University Press, 2007
B. Fajmon, I, Ružičková, Matematika 3, skriptá FEKT VUT, Brno, 2005

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 85

A	B	C	D	E	FX
62,35	18,82	8,24	9,41	1,18	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., RNDr. Ing. Milan Melicherčík, PhD.

Last change: 16.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-128/22	Quantum Theory for Nuclear Physicists

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

Number of credits: 6

Recommended semester: 1.

Educational level: 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: 37

A	B	C	D	E	FX
70,27	16,22	8,11	5,41	0,0	0,0

Lecturers: prof. RNDr. Fedor Šimkovic, CSc., Amina Khatun, PhD., Mgr. Rastislav Dvornický, PhD.

Last change: 18.02.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-126/00	Radiation Environmental Physics

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Students will gain an understanding of the sources, distribution, migration, dispersion, measurement and applications of radionuclides in the environment.

Class syllabus:
1. Sources of ionizing radiation in the biosphere. Primordial and cosmogenic radionuclides.
2. Anthropogenic radionuclides. Ecologically significant radionuclides, radiotoxicity.
3. Distribution, migration and transport of radionuclides in nature.
4. Basic characteristics of radon, solubility, potential alpha energy, equivalent activity concentration.
5. Accumulation of radon decay products.
6. Radon in the outdoor atmosphere, in soil and in living quarters, risk of exposure.
7. Methods of monitoring environmental contamination and environmental processes, reasons for measurement of 226Ra, 232Th, 40K in soils and building materials
8. Measurement of radioactivity in the atmosphere, soil and water, measurement of 222Rn in living quarters and soil.
9. Neutron activation and X-ray fluorescence analysis of environmental pollutants.
10. Effective dose from inhalation of radionuclides.
11. Dose rate from terrigenous radionuclides.
12. Use of radionuclides as tracers of natural processes.
13. National regulations and international recommendations for protection against ionizing radiation.

Recommended literature:
Holá O., Holý K.: Radiačná ochrana : Ionizujúce žiarenie, jeho účinky a ochrana pred ionizujúcim

žiarením. - 1. vyd. - Bratislava : Slovenská technická univerzita, 2010.
Baskaran M.: Radon: A Tracer for Geological, Geophysical and Geochemical Studies, Springer,2016
R. Tykva, D. Berg: Man-Made and Natural Radioactivity in Environmental Pollution and Radiochronology, Kluwer Academic Publishers, 2004
P.P.Povinec, J.A.Sanchez-Cabeza: Radionuclides in the Environment, Elsevier, 2006

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 69

A	B	C	D	E	FX
62,32	15,94	17,39	1,45	1,45	1,45

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

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-141/15	Rare Nuclear Processes

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
written examination, oral examination
Approximate grade thresholds: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Mastering knowledge of the rare nuclear processes and experimental methods used in their research.

Class syllabus:
Higher order processes. Internal Bremsstrahlung. Internal production of electron-positron pairs. Excitation of the electron shell of an atom. Internal conversion. Nuclear isomerism. Neutrino-less double beta decay. Searching for dark matter. Electromagnetic transitions in nuclei. Methodology of experimental research of rare nuclear processes. Low-background gamma-spectrometry. Low-background laboratories. Low-background experiments, underground laboratories

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
75,0	12,5	12,5	0,0	0,0	0,0

Lecturers: doc. Mgr. Róbert Breier, PhD., Ing. Jakub Kaizer, PhD.

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 738

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 435

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 212

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 153

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-232/00	Selected Chapters in Gamma Spectroscopy

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Exam: written and oral exam, successful completion of the written part is condition of the oral part. Share in the overall rating: 80/20. Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, students will be able to use several aspects of spectrometric methods as well as new types of detection systems.

Class syllabus:
Creation and formig of signals in semiconductor detectors, principles of operation and types of semiconductor detectors, characteristic of semiconductor detectors, the signal transmission, electronics for pulse signal processing, perturbing influence of heavy current distribution, cryogenic detectors – types, principles of operation, physical applications.

Recommended literature:
W.R. Leo, Techniques for nuclear and particle physics, Springer Verlag, Berlin, 1996
J. V. Melikov, Experimentalnaja technika v jadernoj fizike, MGU, Moskva, 1973
K. Klainknecht, Detectors for particle radiation, Cambridge University Press, 1998
J. Šeda, J. Sabol, J. Kubálek, Jaderná elektronika, SNTL, Praha, 1977
N. E. Booth, B. Cabrera, E. Fiorini, Low temperature particle detectors, Ann. Rev. Nucl. Part. Sci. ,46, 1996

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 22

A	B	C	D	E	FX
50,0	45,45	4,55	0,0	0,0	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., Mgr. Ivan Kontuľ, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 113

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 86

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 32

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 25

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-109/22	Special Practical in Nuclear Physics (1)

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

Number of credits: 5

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
Half-time decay measurement of the long life isotopes, determining the concentration of some isotopes in the enviroment, (, (, (radiation spectrometry by ionization chamber, semiconductor and scintilation detectors, fission fragment spectrometry, measurement of the nucleus radius, neutron activation analysis, detection of neutrons and determination of the neutron flux.

Recommended literature:
M. Florek a kol. Practical from nuclear physics and electronic, UK edition center, 1990

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
71,11	22,22	6,67	0,0	0,0	0,0

Lecturers: RNDr. Imrich Szarka, CSc., Mgr. Jakub Zeman, PhD.

Last change: 18.02.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-209/00	Special Practical in Nuclear Physics (2)

Educational activities:
Type of activities: laboratory practicals
Number of hours:
per week: 5 **per level/semester:** 65
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: individual work, elaboration of protocols
final evaluation: presentation of results
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%

Learning outcomes:
After completing the course, students will be able to use nuclear spectrometry methods to solve practical problems.

Class syllabus:
Determining of relative intensities of gamma rays using the scintillation detector. Usage of the liquid scintillation spectrometry for the alpha and beta spectra analysis. Principles of application of directional scintillation detector. Characteristics of Ge(Li) and HPGe detectors, methods of evaluation of the peak efficiency of HPGe detector, multicomponent spectra analysis. Coincidence mothods of gamma-ray spectrometry. The analysis of the 152Eu decay scheme.

Recommended literature:
S. Usačev a kol.: Experimentálna jadrová fyzika, ALFA-SNTL, Bratislava 1982
Š.Šáro : Detekcia a spektrometria žiarenia alfa a beta. Alfa, Bratislava, 1983
G.F. Knoll: Radiation Detection and Measurement, John Wiley & Sons, 2000
W.R. Leo: Techniques for Nuclear and Particle Physics Experiments, Springer Verlag, 1994

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 88

A	B	C	D	E	FX
93,18	4,55	1,14	0,0	0,0	1,14

Lecturers: doc. RNDr. Ivan Sýkora, PhD., Mgr. Jakub Zeman, PhD.

Last change: 20.06.2022
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: I.II., II.

Prerequisites:

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

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

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

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 160

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

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

Last change: 16.06.2022
Approved by: prof. RNDr. Jozef Masarik, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: I.II., II.

Prerequisites:

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

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

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

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ will provide sports equipment.

Past grade distribution
Total number of evaluated students: 109

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

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

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/2-FJF-143/16	Standard Model from Experimentalist Point of View

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: homeworks
Final assessment: in case of no homeworks received, written exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): Weight of interim / final evaluation: 100/0

Learning outcomes:
By absolving the course, students achieve overview and will understand basics of the Standard model (SM).

Class syllabus:
1. Basic concept of the high energy physics. Fundamental particles and forces in the SM.
2. Detection of particles in high energy physics. Experimental characteristics of quarks and gluons.
3. Basic ideas of the SM. Particles vs field, calibration symmetries and interaction.
4. SM and Higgs boson. Spontaneous symmetry breaking and mass of the particles.
5. Top quark physics. Top quark production cross sections – theory and experiment.
6. Measurements of the top quark production cross-sections.
7. Jets, jet energy measurement, jet energy scale.
8. Top quark mass as important parameter of the SM. Top quark mass determination.
9. Vector bosons W and Z. Reconstruction of vector bosons and measurement of their masses.
10. Electroweak production of the top quark. Direct measurement of the CKM matrix element Vtb,
11. Asymmetries in particle physics. Asymmetries as consequence of interference.
12. Beyond SM physics. Necessity of the physics beyond SM.
13. Where to look for a physics beyond SM, how to search for a new physics.

Recommended literature:
Dynamics of the Standard Model, Cambridge University Press 1992/ J. F. Donoghue, E. Golowich, B. R.Holstein
Gauge Theories in Particle Physics:A Practical Introduction. Institute of Physics. ISBN 978-0-585-44550-2./ I. Aitchison, A. Hey (2003).

Quarks and leptons:An introductory course in modern particle physics /F. Halzen, A.D. Martin: John Wiley, 1984

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
38,89	44,44	5,56	5,56	0,0	5,56

Lecturers: Mgr. Róbert Astaloš, PhD., doc. Mgr. Pavol Bartoš, PhD., prof. RNDr. Stanislav Tokár, DrSc.

Last change: 22.06.2022

Approved by: prof. RNDr. Jozef Masarik, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KJFB/2-FJF-959/15	**Course title:** Sub-nuclear Physics
Number of credits: 2	
Educational level: II.	
State exam syllabus:	
Last change: 02.06.2015	
Approved by: prof. RNDr. Jozef Masarik, DrSc.	