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: FMFI.KJFB/3-FJF-034/15	**Course title:** Accelerator Ion Technologies
Educational activities: **Type of activities:** lecture / laboratory practicals **Number of hours:** **per week:** 2 / 3 **per level/semester:** 26 / 39 **Form of the course:** on-site learning	
Number of credits: 10	
Recommended semester: 1.	
Educational level: III.	
Prerequisites:	
Course requirements:	
Learning outcomes:	
Class syllabus:	
Recommended literature:	
Languages necessary to complete the course:	
Notes:	

Past grade distribution
Total number of evaluated students: 12

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Miroslav Ješkovský, PhD., Ing. Jakub Kaizer, 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/3-FJF-035/15	Advanced High Energy Physics

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
Interim evaluation: homeworks (30%)
Final assessment: oral exam (70%), to attend the final exam, student have to work up the homeworks during semester
Scale of evaluation: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
Students will deepen their knowledge of electromagnetic, weak and strong interactions of particles, of deep-inelastic processes - especially about electron-proton and hadron-hadron inelastic scattering. A new view on higher-order processes and the renormalization procedure will be given. The basics of quantum chromodynamics will be explained, including the evolution equations for quark and gluon densities. Furthermore, there will be questions about weak processes and associated C, P and CP-parity violation phenomena, questions of unification of electromagnetic and weak interactions, and the basics of the Standard Model and the new physics.

Class syllabus:
:
1. Brief overview of the basics of elementary particle physics
2. Interaction of spin 0 and 1/2 particles with electromagnetic field.
3. On field quantization. The scattering matrix and its expansion.
4. Causality and Green's function, propagators of particles with different spin
5. Second order perturbation theory and charge renormalization, running coupling constant.
6. Dimensional regularization and renormalization.
7. Structure of hadrons. Parton model, parton distribution functions.
8. Fundamentals of quantum chromodynamics. Evolution of quark and gluon densities - DGLAP.
9. QCD application. Top quark physics – production cross sections: theory and experiment,
10. Weak interactions, muon decay; C, P and CP violation. Oscillations of neutral K-, D-, B-mesons.
11. Electro-weak unification, calibration symmetries, spontaneous symmetry breaking.
12. Standard model. Particle masses.
13. Physics of Higgs boson, vector W and Z bosons and new physics

Recommended literature:

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

Quarks and leptons: : An introductory course in modern particle physics / Francis Halzen, Alan D. Martin. [s.l.] : John Wiley, 1984

An introduction to quantum field theory / Michael E. Peskin, Daniel V. Schroeder. Boulder : Westview Press, 1995

Expected performance of the ATLAS experiment detector, trigger and physics : The ATLAS collaboration : Volume 3: Higgs Boson, supersymmetry, exotic processes. Geneva : CERN-OPEN, 2009

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution

Total number of evaluated students: 12

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Stanislav Tokár, 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.KJFB/3-FJF-037/15	Advanced Nuclear 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: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
Evaluation during the semester: homeworks
Final evaluation: oral exam
50% points needed to pass exam

Learning outcomes:
The student gains more detailed knowledge of the nuclear physics topics, the structure of atomic nuclei and typical projects running nowadays.

Class syllabus:
Summary of nuclear models. Spherical shell model and nuclear excitations, Deformation of the nucleus, magnetic and electric moments of nuclei. Deformed shell model. Shape coexistence. Kollective excitations.
Nuclear isomers. Decay spectroscopy. Laser spectroscopy. Nuclear fission.
Selected topics for various topics. Neutron and proton halo. Influence of nuclear structure on astrophysical reactions. Proton and neutron dripline. Influence of closed-shell on the stability and decay of atomic nuclei. New magic numbers. Production and properties of superheavy elements. Chemistry of superheavy elements.
The complete fusion reaction and separation of reaction products. Transfer reactions. Nuclear fragmentation and separation of fragments. Radioactive-ion beam measurements. Post-acceleration of radioactive beams.

Recommended literature:
Nuclear structure from a simple perspective / R. F. Casten. Oxford : Oxford University Press, 2000
Introductory nuclear physics / Kenneth S. Krane. Hoboken : Wiley, 1988
Basic ideas and concepts in nuclear physics an introductory approach / Kris Heyde. Bristol : Institute of Physics Publishing, 1999
Cyriel Wagemans, The Nuclear Fission Process, CRC Press, 1991
K.S. Krane, Introductory Nuclear Physics, John Wiley & Sons, 1988.

Languages necessary to complete the course:

Notes:	
Past grade distribution Total number of evaluated students: 9	
ABS	NEABS
100,0	0,0
Lecturers: doc. Mgr. Stanislav Antalic, 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/3-FJF-040/22	Astroparticle 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: 10

Recommended semester: 2.

Educational level: III.

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

ABS	NEABS
0,0	0,0

Lecturers:

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/3-FJF-301/15	Category A Publication

Educational activities:
Type of activities: independent work
Number of hours:
per week: 30 **per level/semester:** 390
Form of the course: on-site learning

Number of credits: 30

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 17

ABS	NEABS
100,0	0,0

Lecturers:

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/3-FJF-026/15	Computer Simulations in Radiation 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: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 12

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Jozef Masarik, DrSc., doc. Mgr. Róbert Breier, 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.KJP/3-MXX-101/15	Course of English for PhD Studies (1)

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

Number of credits: 5

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 239

A	ABS	B	C	D	E	FX	NEABS
35,15	61,09	0,42	0,0	0,0	1,67	0,0	1,67

Lecturers: Mgr. Simona Dobiašová, PhD., Mgr. Aneta Barnes

Last change: 13.01.2025

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/3-FJF-203/15	Department Seminar (1)

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

Number of credits: 5

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 18

ABS	NEABS
100,0	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: FMFI.KJFB/3-FJF-204/15	**Course title:** Department 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: 5	
Recommended semester: 2.	
Educational level: III.	
Prerequisites:	
Course requirements:	
Learning outcomes:	
Class syllabus:	
Recommended literature:	
Languages necessary to complete the course:	
Notes:	

Past grade distribution
Total number of evaluated students: 17

ABS	NEABS
100,0	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/3-FJF-205/15	Department Seminar (3)

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: 5

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 15

ABS	NEABS
100,0	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/3-FJF-206/15	Department Seminar (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: 5

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 12

ABS	NEABS
100,0	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/3-FJF-023/15	Detection Technique and Monitoring Systems

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: 10

Recommended semester: 1.

Educational level: III.

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:
Students should be able to apply complex methods for determination of basic physical characteristics and use detection systems in various areas of human activity.

Class syllabus:
Fundamental physics and characteristic properties of detectors, ionization measurement methods, position measurement - particle trajectories, interaction sites, time measurement, particle identification, energy measurement, momentum measurement, applications of detection systems - medical applications, geophysical applications, space research, detection systems for high energy physics experiments.

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

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 8

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Ivan Sýkora, PhD., Mgr. Ivan Kontuľ, 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/3-FJF-033/15	English Seminar on Nuclear and Subnuclear Physics

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 19

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Pavel Povinec, DrSc., 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/3-FJF-111/15	Individual Study of Science and Research Resources (1)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 10 **per level/semester:** 130
Form of the course: on-site learning

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 21

ABS	NEABS
100,0	0,0

Lecturers:

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/3-FJF-112/15	Individual Study of Science and Research Resources (2)

Educational activities:
Type of activities: independent work
Number of hours:
per week: 10 **per level/semester:** 130
Form of the course: on-site learning

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 19

ABS	NEABS
100,0	0,0

Lecturers:

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/3-FJF-039/22	Low-background Experiment in Underground Laboratories

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: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
By completing the subject, students will gain knowledge about the latest trends in nuclear and particle physics experiments performed in underground laboratories using low-background detectors.

Class syllabus:
1. Low background detectors
2. Radiogenic background in low background nuclear physics
3. Cosmic radiation at surface and underground
4. Monte Carlo simulations of cosmic-ray background
5. Monte Carlo simulations of radionuclide contributions of background
6. Radioactive contamination of construction materials of low background detectors
7. Radiopurity screening by radiometric methods
8. Mass spectrometry radiopurity analyses
9. Comparison of underground laboratories
10. Double beta decay
11. Dark matter
12. Leading experiments on rare nuclear decays in underground laboratories
13. Leading experiments on search for dark matter particles in underground laboratories

Recommended literature:
[1] H.V. Klapdor-Kleingrotthause, Seventy years of double beta decay. World Scientific, (2010), S. 1520.
[2] B. Glegg, Dark matter and energy, Icon Books, (2019), S. 176.

[3] G. Heussser, Low-radioactivity background techniques. Annual Reviews of Nuclear and Particle Science, 1995, 45:543-90.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers: doc. Mgr. Róbert Breier, PhD., Ing. Jakub Kaizer, 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/3-FJF-038/22	Management of Scientific Work

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: 5

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:
1. Working with professional and scientific literature and publishing databases
2. Principles of good scientific work
3. Prepare your publication
4. Preparation of the conference lecture
5. Preparation of a scientific grant
6. Management of scientific grants in personnel and financial terms
7. Conducting student and final works

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 5

ABS	NEABS
100,0	0,0

Lecturers: doc. Mgr. Stanislav Antalic, PhD., prof. RNDr. Jozef Masarik, DrSc.

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: FMFI.KJFB/3-FJF-701/15	**Course title:** Obtaining a Grant
Educational activities: **Type of activities:** other **Number of hours:** **per week:** 20 **per level/semester:** 260 **Form of the course:** on-site learning	
Number of credits: 20	
Recommended semester: 4.	
Educational level: III.	
Prerequisites:	
Course requirements:	
Learning outcomes:	
Class syllabus:	
Recommended literature:	
Languages necessary to complete the course:	
Notes:	

Past grade distribution
Total number of evaluated students: 23

ABS	NEABS
100,0	0,0

Lecturers:
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/3-FJF-403/22	Presentation at Department Seminar

Educational activities:
Type of activities: other
Number of hours:
per week: 20 **per level/semester:** 260
Form of the course: on-site learning

Number of credits: 20

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

ABS	NEABS
100,0	0,0

Lecturers:

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/3-FJF-402/22	Presentation at a Home Conference

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: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 9

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 22.02.2022

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: FMFI.KJFB/3-FJF-401/15	**Course title:** Presentation at an International Conference
Educational activities: **Type of activities:** independent work **Number of hours:** **per week:** 20 **per level/semester:** 260 **Form of the course:** on-site learning	
Number of credits: 20	
Recommended semester: 6.	
Educational level: III.	
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

ABS	NEABS
100,0	0,0

Lecturers:
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: FMFI.KJFB/3-FJF-305/15	**Course title:** Publication in a Reviewed Periodical
Educational activities: **Type of activities:** independent work **Number of hours:** **per week:** 15 **per level/semester:** 195 **Form of the course:** on-site learning	
Number of credits: 15	
Recommended semester: 4.	
Educational level: III.	
Prerequisites:	
Course requirements:	
Learning outcomes:	
Class syllabus:	
Recommended literature:	
Languages necessary to complete the course:	
Notes:	
Past grade distribution Total number of evaluated students: 16	

ABS	NEABS
100,0	0,0

Lecturers:
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/3-FJF-704/15	Response to a WoK- or SCOPUS-registered Publication

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

Number of credits: 6

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers:

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: FMFI.KJFB/3-FJF-702/15	**Course title:** Scientific Project Co-researcher
Educational activities: **Type of activities:** independent work **Number of hours:** **per week:** 10 **per level/semester:** 130 **Form of the course:** on-site learning	
Number of credits: 10	
Recommended semester: 4.	
Educational level: III.	
Prerequisites:	
Course requirements:	
Learning outcomes:	
Class syllabus:	
Recommended literature:	
Languages necessary to complete the course:	
Notes:	
Past grade distribution Total number of evaluated students: 40	

ABS	NEABS
100,0	0,0

Lecturers:
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/3-FJF-025/15	Selected Topics in Radiation Physics

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: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
A student may earn 50% for the course project and presentation per semester and the final oral exam is weighted 50%. A student must earn at least half of the points for the project in order to pass the final oral exam. The student must also score at least 26 points on the final oral 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: 50% mid-term assessment (project + presentation) / 50% final oral examination.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will gain up-to-date information and knowledge in radiation physics and dosimetry of ionizing radiation.

Class syllabus:
1. Natural and artificial sources of radiation.
2. Migration, concentrations and variations of radionuclides.
3. Environmental models: dispersion of radionuclides in the atmosphere, lithosphere and hydrosphere.
4. Exposure from clouds and from deposited radionuclides.
5. Use of radionuclides as tracers of natural processes.
6. Use of radon in environmental studies.
7. Dosimetry of natural and artificial radiation sources.
8. Spectrometry of natural gamma radiation.
9. Laboratory measurement of natural samples, monitoring of artificial radiation sources.
10. Physical principles of microdosimetry: linear energy transfer, linear energy, specific energy.
11. Spectra of microdosimetric quantities.
12. Experimental methods of microdosimetry.
13. Applications of microdosimetry in radiobiology, radiotherapy and radiation protection.

Recommended literature:
Analysis of environmental radionuclides / editor Pavel P. Povinec. Amsterdam: Elsevier, 2008

K. Froelich at al.: Environmental radionuclides: tracers and timers of terrestrial processes. Elsevier, 2010
J.E.Till at al.: Radiological risk assessment and environmental analysis. Oxford University Press, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Radoslav Böhm, PhD., doc. RNDr. Monika Müllerová, 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/3-FJF-036/15	Subnuclear Physics Experiment Modelling and Data Analysis

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: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
Students will understand how to model random variables, how to simulate interaction of a particle with material and random processes in physics in general. They will further enhance their understanding of probability theory, estimators and hypothesis testing. They will expand their knowledge on applications of machine learning to solve problems in physics and gain overview of up-to-date methods of unfolding to estimate true distributions from observations smeared by experimental measurement.

Class syllabus:
1. Probability theory and statistics. Error propagation and decorrelation of correlated random variables.
2. Random number distrubutions encountered in physics. Generating random numbers on a comupter.
3. Estimators and statistical tests.
4. Fisher discriminant, p-value and statistical significance of a measurement.
5. Machine learning (ML) in physics. Application of ML for classification problem.
6. Training of ML models, regularization methods, choice of input features, unsupervised machine learning.
7. Deconvolution (unfolding). Issues with a naive approach to unfolding.
8. Parametrized unfolding, Singular Value Decomposition Unfolding and Iterative Bayesian Unfolding.
9. Hypothesis testing. Quantifying agreement between data and the model. Chi-square and likelihood approaches.
10. Maximum likelihood fit and uncertainty estimation. Exclusion limits.
11. Impact of systematic uncertainties on measurement precision and their inclusion via profile likelihood.
12. Stochastic processes. Markov’s chains, modelling of interacion between particles and material. Transport equation. Variance reduction methods.

Recommended literature:

O. Behnke, K. Kröninger, G. Schott, T. Schörner-Sadenius, Data Analysis in High Energy Physics: A Practical Guide to Statistical Methods, John Wiley & Sons Inc, (2013), S. 440.
R. J. Barlow, Statistics: A Guide to the use of Statistical Methods in the Physical Sciences, John Wiley & Sons Inc, (1989), S. 240.
G. Bohm, G. Zech, Introduction to Statistics and Data Analysis for Physicists, Verlag Deutsches Elektronen-Sychrotron (2010), S. 412. 470.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 12

ABS	NEABS
100,0	0,0

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

Last change: 22.06.2022

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