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.KEF/2-FFP-211/00	Advanced Laboratory Exercises from Plasma Physics

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

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Assessment during the semester: control of preparation for laboratory work, reports of laboratory work
Approximate evaluation grades: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Gaining practical experience from basic experimental methods of plasma physics directly at the facilities where scientific projects are solved by research teams of the Plasma Physics and Environmental Physics.

Class syllabus:
Discharges in gases. Measurement of plasma parameters. Modification of materials by interaction with plasma. Atmospheric pressure plasma properties. Plasma laser absorption spectroscopy. Plasma optical emission and absorption spectroscopy. Analysis of chemical products of plasmachemical reactions. Measurement of effective cross sections of selected elementary processes. Properties of microdischarges and their applications. Imaging of nanosecond pulse discharges by ICCD camera.

Recommended literature:
Actual articles delivered by respective laboratories.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 51

A	B	C	D	E	FX
88,24	7,84	3,92	0,0	0,0	0,0

Lecturers: doc. RNDr. Juraj Országh, PhD., doc. RNDr. Peter Papp, PhD., doc. RNDr. Veronika Medvecká, PhD.
Last change: 31.01.2022
Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-213/15	Analytical Methods in Plasma Physics

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

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Extension of knowledge about physical principles of analytical methods used for diagnostics of liquid, gaseous and solid substances. Students will be able to choose the optimal analytical method for plasma-treated samples.

Class syllabus:
Analytical methods for plasma modified products:
- gaseous: IR spectroscopy, gas chromatography, gas chromatography + mass spectrometry, ion mobility spectrometry, chemiluminescence.
- liquid: electron paramagnetic resonance (EPR), liquid chromatography, absorption, transmission, and scattering (UV, IR, Raman) spectrometry.
- solid: surface energy measurement, electron microscopy (SEM, TEM, EDX, WDX), X-ray photoelectron spectroscopy (XPS), Secondary ion mass spectrometry (SIMS).

Recommended literature:
Principles of plasma physics for engineers and scientists / Umran Inan, Marek Golkowski. Cambridge : Cambridge University Press, 2011
G. Tranter: Encyclopedia of spectroscopy and spectrometry, AP 2000

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 25

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

Lecturers: doc. RNDr. Veronika Medvecká, PhD., doc. RNDr. Miroslav Zahoran, CSc., doc. RNDr. Karol Hensel, PhD., doc. RNDr. Anna Zahoranová, PhD., prof. Dr. Štefan Matejčík, DrSc., RNDr. Ladislav Moravský, PhD., Mgr. Petra Šrámková, PhD.
Last change: 30.01.2022
Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FTL-204/22	Diagnostic Methods in Solid State Physics

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

Number of credits: 5

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
The evaluation of the course has a form of an oral exam, grading of which reflects the overall orientation of the student in the covered topics. Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
By completing the course, students will gain an overview of selected analytical, spectroscopic and microscopic methods used for studies of solids in terms their structure, composition, surface topography and other properties.

Class syllabus:
Electron and ion optics, types of analyzers for analytical and spectroscopic methods.
Principles and description of methods:
- X-Ray photoelectron spectroscopy, Auger electron spectroscopy, UPS, IS
- X-ray and electron diffraction, small angle scattering and related methods
- Scanning and transmission electron microscopy and related methods (EDX, WDS, FIB)
- Scanning probe microscopy (STM, AFM, EFM, MFM, SSRM, KPFM)
and others.

Recommended literature:
Elektronová spektroskopia : Metody analýzy povrchů / F. Allmer ...[et al.]; editorka Ludmila Eckertová. Praha : Československá akademie věd , 1990
V.Valvoda, M.Polcarová, P. Lukáč, Základy strukturní analýzy, Karolinum, Praha, 1992, pp. 492, ISBN 80-7066-648-X
J. M.Zuo, J. C.H. Spence, Advanced Transmission Electron Microscopy, Springer, New York, NY, 2017, ISBN 978-1-4939-6605-9
J.F. Watts, J. Wolstenholme, An introduction to surface analysis by XPS and AES, John Wiley & Sons, 2003, pp. 212, ISBN 978-0-470-84713-8
Scanning probe microscopy and spectroscopy, ed. D.A.Bonnel, John Willey & Sons, New York, 2001, pp. 493, ISBN 0-471-24824-X

M.Birkholz, Thin film analysis by X-ray scattering, Wiley-VCH Verlag GmbH, Weinheim, 2006, pp. 356, ISBN 3-527-31052-5
T.L.Alford, L.C.Feldman, J.W.Mayer, Fundamentals of Nanoscale Film Analysis, Springer, 2007, pp. 336, ISBN 978-0-387-29260-1
E.Mayer, H.J.Hug, R.Bennewitz, Scanning Probe Microscopy: The Lab on a Tip, Springer, 2004, pp. 210, ISBN 3-540-43180-2

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

Notes:

Past grade distribution
Total number of evaluated students: 54

A	B	C	D	E	FX
59,26	29,63	7,41	3,7	0,0	0,0

Lecturers: doc. Ing. Maroš Gregor, PhD., doc. RNDr. Tomáš Plecenik, PhD., doc. RNDr. Tomáš Roch, Dr. techn., Mgr. Leonid Satrapinskyy, PhD., Mgr. Branislav Grančič, PhD.

Last change: 03.12.2021

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-914/15	Diploma Thesis (1)

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

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: check at predefined stages.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Diploma thesis preparation. Student gains skills relevant for diploma thesis preparation, learns methods, procedures and techniques relevant for diploma project.

Class syllabus:
Student is involved in scientific work relevant to diploma thesis, performs theoretical and experimental tasks, analyses results, discusses results with supervisor.

Recommended literature:
Methods of experimental Physics / n Volume 9 : Plasma Physics Part B / Edited by : Hans R. Griem, Ralph H. Lovberg. New York : Academic Press, 1971

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
96,55	3,45	0,0	0,0	0,0	0,0

Lecturers:

Last change: 22.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-915/15	Diploma Thesis (2)

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

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: check at predefined stages.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Further diploma thesis preparation. Student improves scientific skills and methods in theoretical and experimental field relevant for diploma thesis preparation. Students learns procedures and techniques of results processing and analysis.

Class syllabus:
Experimental measuremens, verification of results, confrontation with theoretical assumptions and other known results.
Student is involved in scientific work relevant to diploma thesis, performs theoretical and experimental tasks, analyses results, discusses results with supervisor and writes thesis chapters.

Recommended literature:
Methods of experimental Physics / n Volume 9 : Plasma Physics Part B / Edited by : Hans R. Griem, Ralph H. Lovberg. New York : Academic Press, 197

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 26

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

Lecturers:

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-916/15	Diploma Thesis (3)

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

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: check at predefined stages.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Student writes thesis conforming to all the rules and requirements for diploma thesis and creates base for successful end of master study and thesis defense.

Class syllabus:
Student is involved in scientific work related to the thesis, performs theoretical and experimental tasks, analyses results, discusses them with supervisor and in this phase is mainly devoted to writing the thesis.

Recommended literature:
Methods of experimental Physics / n Volume 9 : Plasma Physics Part B / Edited by : Hans R. Griem, Ralph H. Lovberg. New York : Academic Press, 1971

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 25

A	B	C	D	E	FX
92,0	8,0	0,0	0,0	0,0	0,0

Lecturers:

Last change: 22.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KEF/2-FFP-991/15	**Course title:** Diploma Thesis Defense
Number of credits: 10	
Educational level: II.	
Course requirements: Exam type: oral Approximate evaluation grades: A 90%, B 80%, C 70%, D 60%, E 50% Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The thesis defence is the result of the course. The student shows the ability to work scientifically under the supervision, shows the ability to solve problems in the field of plasma physics, present them to professionals in the field and defend the results.	
Class syllabus: After thesis preparation under the supervision the thesis is submitted. The student gets reviews of her/his thesis and prepares the responses to questions. After defending the thesis he/she responds to questions raised mostly by the reviewers and committee and contributes to discussion about the main results of his/her thesis.	
State exam syllabus:	
Recommended literature: Thesis relevant scientific papers.	
Languages necessary to complete the course: english	
Last change: 18.02.2022	
Approved by: prof. Dr. Štefan Matejčík, DrSc.	

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-231/22	Diploma Thesis Seminar (1)

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

Number of credits: 1

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: homeworks, presentations
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Systematic preparation for writing the thesis, learning methodological procedures of thesis preparation, gaining overview of current state of the art. Literature overview relevant for the thesis, processing and analyses of results.

Class syllabus:
Study of current scientific publications relevant for diploma thesis, analysis of scientific publications, analysis of experimental and scientific results gained during thesis preparation, comparison of results, presentation, critic discussion.

Recommended literature:
Current scietific publication relevant for thesis theme.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 42

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

Lecturers: prof. Dr. Štefan Matejčík, DrSc., doc. RNDr. Anna Zahoranová, PhD.

Last change: 25.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-232/10	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: 4.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: homeworks, presentations
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Systematic preparation for the defense of the diploma thesis, which will result in improving student‘s ability to present the results obtained during the preparation. Ability to defend used scientific procedures and to reflect on the opinions of reviewers.

Class syllabus:
Presentation of current scientific knowledge in the field of diploma thesis theme, presentation of own results obtained during research. Basics of presentation of scientific results, basics of leading scientific discussion.

Recommended literature:
Visualization in scientific computing / Martin Göbel, Heinrich Müller and Bodo Urban (eds.). Wien : Springer, 1995
Current scientific papers relevant to thesis theme.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 33

A	B	C	D	E	FX
96,97	3,03	0,0	0,0	0,0	0,0

Lecturers: prof. Dr. Štefan Matejčík, DrSc., doc. RNDr. Anna Zahoranová, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-110/15	Electrical Discharges in Gases

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: 2.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: individual work/final exam
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The students obtain the overview of electric discharges in gases, their basic principles and mechanisms.

Class syllabus:
Introduction - classification of discharges, stationary el. discharges and conditions of their origin and existence, sources of ionizing radiation, electron avalanches and non-self-sustained discharge, Townsend ionization coefficient, Penning ionization, emission and secondary emission of electrons (thermo-emission, auto-emission and types of secondary emission, Townsend coefficient of secondary emission), avalanche theory of self-sustaining el. discharge, Townsend discharge, Paschen 's law, space charge distribution.
Glow discharge - origin of development from Townsend's discharge, structure and forms, cathode layer and positive column, anode region, radial and axial potential distribution, glow discharge with hollow cathode, applications (fluorescent lamps, lasers, magnetrons, PIII, ...)
Arc discharge - development from glow discharge, basic properties and types of arc (transferred, non-transferred, vacuum and gliding arc), cathode areas, energy balance of the arc, use (plasmatrons, welding, switching arc).
High frequency discharge - basic properties and types of HF discharges, electron motion in HF field, diffusion ignition theory, alpha-gamma transition, capacitive and inductively coupled discharge, microwave discharge, utilization (plasma etching, thin film deposition, TOKAMAK).
Spark discharge and discharges in the atmosphere - origin and development of spark discharge, streamer theory (primary and secondary, streamer criterion of self-sustaning discharge), use of spark discharge (spark gap, shock wave generation, spark plug), long spark (leader formation), lightning formation, ball lightning, discharges in the upper atmosphere.

Corona discharge - basic properties, ingition intensity of electric field, V-A characteristics and theory of DC corona discharge, application (ion sources, electrostatics, electric wind, applications of alternating and pulsed discharge, HV conduction).
Barrier discharges - volume and surface barrier discharges, mechanisms of barrier discharges (streamer mechanism, so-called APGD), applications (ozonizators, plasma chemistry, excimer lasers, discharges in dielectric cavities, applications in aerodynamics).
Discharges in liquids - basic physical mechanisms, electronic and thermal theory, use (HV insulation, discharges in liquid inert gases, AOPs).

Recommended literature:
J.R.Roth: Industrial plasma engineering 1 - Principles, IoP 2001

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
55,17	34,48	10,34	0,0	0,0	0,0

Lecturers: doc. Mgr. Dušan Kováčik, PhD., doc. RNDr. Matej Klas, PhD.

Last change: 30.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-112/00	Electron Optics and Mass 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: 1.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: homeworks and tests
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will gain theoretical knowledge in the field of particle motion in various electric and magnetic fields. Using computer methods, they will be able to design systems of electron and ion optics, model the optical properties of electrostatic, dynamic and magnetic systems, mass spectrometers. They will be able to select and design the most suitable solutions in the field of mass spectrometry regarding the selection of spectrometers, ion sources and their important parameters.

Class syllabus:
Movement of ions and electrons in various types of electrostatic, magnetic fields. Electron and ion beam sources for various applications, electrostatic, magnetostatic optical elements for charged particles, monochromators and charged particle analyzers. Ion sources for mass spectrometers. Types and constructions of mass spectrometers (magnetic, dynamic, time-of-flight mass spectrometers), ion detectors, additional equipment, isotopic analysis, interpretation of mass spectra. Ion mobility spectroscopy.

Recommended literature:
Mass spectrometry : Principles and applications / Edmond de Hoffmann, Vincent Stroobant. Chichester : John Wiley, 2007
C. G. Herbert, R. A. W. Johnstone: Mass spectrometry basics, CRC Press, London, 2003

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 52

A	B	C	D	E	FX
98,08	1,92	0,0	0,0	0,0	0,0

Lecturers: prof. Dr. Štefan Matejčík, DrSc., RNDr. Ladislav Moravský, PhD., doc. RNDr. Juraj Országh, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-116/22	Electron and Ion Optics

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

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
To acquaint students with analytical and spectroscopic methods for the study of plasma physics in terms of their structure, composition and use.

Class syllabus:
Geometric optics, paraxial beams, dispersion, electric amagnetic lenses, focal length and main planes, aberrations, resolution, types of analyzers for analytical and spectroscopic methods, sources of electrons and ions.

Recommended literature:
P.Dahl, Introduction to electron and ion optics, Academic press, New York, 1973, pp. 147, ISBN 0-12-200650-X
J. F. Watts, J. Wolstenholme, An introduction to surface analysis by XPS and AES, John Wiley & Sons, 2003, pp. 212, ISBN 978-0-470-84713-8
Scanning probe microscopy and spectroscopy, ed. D.A.Bonnel, John Willey & Sons, New York, 2001, pp. 493, ISBN 0-471-24824-X

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: prof. Dr. Štefan Matejčík, DrSc., RNDr. Ladislav Moravský, PhD.

Last change: 31.01.2022
Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FTL-115/22	Electronic Circuits

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

Number of credits: 8

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous: Homework, 20%
Final: Project, 80%
The course will be classified provided that the student proves the fulfilment of obligations at the level of at least 51 %. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Students acquire essential knowledge on principles of electronic devices (passives, diodes, transistors, thyristors), linear circuit analysis, noise analysis, power and noise matching. They acquire skills on basic electronic circuitry design. They learn the principles of microwave techtique, signal propagation in waveguides and antennas, and impedance matching as well

Class syllabus:
Diodes, bipolar and FET transistors, thyristors – principles of operation, basic circuits and applications. OpAmps – basic circuits and applications. Passive and active RLC circuits. Linear circuit analysis – impulse, transient and frequency response. Stochastic signal analysis. Noise. Power, impedance and noise matching. Active filters, power amplifiers, precise amplifiers. Transmission line theory, waveguides, standing waves, load matching. Cavity and microstrip resonators. Antennas.

Recommended literature:
The Art of Electronics/P. Horowitz, P. Hill, Cambridge University Press, ISBN 978-0-521-37095-0
Physics of Semiconductor Devices/S. M. Sze, K. Ng, Wiley-Interscience (2006)
Elektronika veľmi vysokých frekvencií / Andrej Tirpák. Bratislava : Univerzita Komenského, 2001

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

Notes:

Past grade distribution
Total number of evaluated students: 57

A	B	C	D	E	FX
54,39	26,32	10,53	7,02	1,75	0,0

Lecturers: doc. RNDr. František Kundracik, CSc., doc. RNDr. Michal Maheľ, CSc.

Last change: 20.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-104/00	Elementary Processes in Plasma

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:
Exam: oral
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing this course, students will master the basic types of processes taking place in low-temperature as well as high-temperature plasma. The processes will be categorized in terms of reaction kinetics, in terms of reactants entering the reactions. They will be able to construct basic kinetic equations and solve them. During the semester, they will learn the basic experimental and theoretical methods of studying elementary processes.

Class syllabus:
Introduction to the kinetics of plasma reactions, the concepts of cross section, differential cross section, rate constant and experimental methods of their measurement. Unimolecular, two- and three-body reactions. Electron collisions with molecules (electron impact ionization, electron attachment, excitation reactions). Ion-molecular reactions in plasma (charge exchange, atomic exchange, association reactions, cluster formation), positive and negative ions. Recombination reactions of electrons and ions (radiative recombination, dissociative recombination, three-body recombination). Photon interactions (photoionization, photoexcitation, absorption). Excited particle interactions (radiative deexcitation, Penning ionization, fluorescence). Chemical reactions in plasma. Interactions of plasma and radiation with walls (electrons, ions, photons with surfaces).

Recommended literature:
Kinetic Processes in Gases and Plasmas / edited by A. R. Hochstim. New York : Academic Press, 1969
E. Illenberger, J. Momigmny: Gaseous Molecular Ions, Springer Verlag, New York, 1985
P. Atkins: Physical Chemistry, 5th edition, Oxford University Press, Oxford, 1985

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 77

A	B	C	D	E	FX
92,21	7,79	0,0	0,0	0,0	0,0

Lecturers: prof. Dr. Štefan Matejčík, DrSc., doc. RNDr. Peter Papp, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FTL-117/22	Laboratory Practice in Solid State Physics

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

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous: protocols plus final project
Scale of assessment (preliminary/final): Partial protocols, 60% Final: Project, 40% The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
Students will apply the knowledge from lectures “Optical and Electrical Properties of Solids and Physics of Semiconductor and Semiconductor Devices”. Students will gain the appropriate practical experiences from thin film preparations and characterizations. (Basically – resistivity, mobility, band gap etc.) The prepared thin films in consequence will use to process electronic device as transistor, diode, Hall probe or sensor. Finally they characterize the prepared device.

Class syllabus:
The selection of material and prepared device we will decided in the beginning of semester in connection to actual problems solved at the department.
Epitaxial film growth (MOCVD, ALD, PLD)- Thickness and composition evaluation.
Lattice mismatch estimation (XRD)
Optical and electrical properties measurements (transmission , reflection (Eg), Pauw)
Photoluminescence measurements
Thin oxide films (thermal oxidation process or ALD growth)
Metal thin films prepared by evaporation or by sputtering.
Processing of devices – techniques of lithography.
Optical/Electron beam/AFM microscopy.
Devices characterization measurements

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 49

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

Lecturers: RNDr. Ján Greguš, PhD.

Last change: 27.06.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF+KAFZM/2-FFP-204/15	Modelling in Plasma Physics

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

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: individual work
Exam: oral
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing this course, the student will be able to create a simple program for numerical modeling of particle motion in plasma, a simple chemical kinetic model of plasma. He will be able to use the freely available program ZDPlasKin to solve more complex problems in kinetic modeling in plasma. At the same time, they will get acquainted with simple approximate approaches to the solution of the electron shell of atoms and molecules using the GAUSSIAN software package and will be able to model the theoretical course of the effective cross section of electron ionization of any molecule using BEB theory.

Class syllabus:
Numerical simulations of particle motion, Newton-Euler scheme, PIC simulations, numerical solution of Boltzman's equation, Monte Carlo (MC) simulations of charged particle dynamics, use of MC method to determine equilibrium and time variable EEDF (electron energy distribution function), kinetics and reactions of ions in plasma, kinetic modeling in plasma, 0-D kinetic model, use of programs CHEMKIN 2T and ZDPlasKin, practical examples of plasmachemical kinetic modeling, 1-D Chemical model of corona in coaxial geometry, calculation basic properties of molecules using GAUSSIAN, Hartree-Fock method, Møller-Plesset perturbation theory, BEB model of effective electron ionization cross section, CBS approximations.

Recommended literature:
Kinetic Processes in Gases and Plasmas / edited by A. R. Hochstim. New York : Academic Press, 1969
Molecular quantum mechanics / Peter Atkins, Ronald Friedman. Oxford : Oxford University Press, 2005

Exploring Chemistry with Electronic Structure Methods / James B. Foresman, AEleen Frisch. Gaussian, Inc, 1993, 1995-96, 2015

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
89,66	10,34	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mário Janda, PhD., doc. RNDr. Peter Papp, PhD.

Last change: 31.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-214/22	Molecular Spectra 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: 4.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Theoretical background of energy states of molecules, their spectral characteristics, quantum-chemical description of rotational and vibrational motions. To provide an overview of the basic types of molecular spectroscopy, to characterize the symmetry of transitions, spin-orbital coupling and its consequences.

Class syllabus:
Energy levels of molecules. Born - Oppenheimer approximation. Rotational and vibrational states of diatomic molecules. Rotational levels of polyatomic molecules. Vibration of polyatomic molecules. Electron states and electron spectra. Symmetry of vibration transitions, selection rules. Spin-orbital coupling.

Recommended literature:
Molecular quantum mechanics / Peter Atkins, Ronald Friedman. Oxford : Oxford University Press, 2005
Exploring Chemistry with Electronic Structure Methods / James B. Foresman, AEleen Frisch. Gaussian, Inc, 1993, 1995-96, 2015
Molecular symmetry and Spectroscopy, P. Jensen, P.R. Bunker, ISBN-13: 978-0660175195

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: doc. RNDr. Peter Papp, PhD., doc. Mgr. Peter Čermák, PhD.

Last change: 30.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF+KAFZM/2-FOL-215/22	Optical 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: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: individual work
Exam: oral
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
The student will gain theoretical knowledge to master the principles of spectroscopy. He / she will acquire basic skills necessary for practical spectroscopic measurement and use of spectroscopy. The student will gain knowledge about the principles of spectroscopic methods, which can be used in practice in the optical diagnostics of gases and plasma.

Class syllabus:
- Basic principles of emission and absorption spectroscopy, databases with spectral constants. Identification of radiating resp. absorbing atoms and molecules according to available databases. Spectral line profile, natural width sp. lines, classical and quantum. approach. Extension of spectral lines in plasma (Doppler, collision and Strake extension of spectral lines).
- Basics of molecular spectroscopy. Molecular spectrum theory. Rotational and vibrational energy. Classification of electronic states. Simulation of diatomic molecule / radical spectra.
- Methods of spectroscopic diagnostics (from the value of intensity, from the width of the spectral line, from the shape of the molecular spectrum, titration and actinometric method of determining the concentration of radicals, determining the characteristic temperatures of the system from atomic and molecular spectra - fully or partially resolved spectra, simulation of molecular spectra, comparison).

Recommended literature:
Molecular spectroscopy / Zuzana Chorvátová. Bratislava: Comenius University, 1987
Laser spectroscopy: Basic concepts and instrumentation / Wolfgang Demtröder. Berlin: Springer, 1981
Spectropolarimetric diagnostics of gas strips / S. A. Kazancev, A. V. Subbotenko. Saint-Petersburg: Izdateľstvo Sankt-Peterburgskogo universiteta, 1993

G. V. Marr: Plasma Spectroscopy, Elsevier, 1968

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 33

A	B	C	D	E	FX
69,7	30,3	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Pavel Veis, CSc., doc. RNDr. Mário Janda, PhD.

Last change: 18.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FOL-115/22	Optics and Lasers

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

Learning outcomes:
The student will gain basic knowledge of optics, spectrometers, detectors, lasers and their applications.

Class syllabus:
Spectral areas from vacuum UV to IR area. Optical properties of materials. Spectrometers (prismatic, cross - sectional). Vacuum UV spectroscopy, UV-NIR, IR region (specific). Interferometers. Optical fibers. Detectors (photodiode, CCD, iCCD, EMCCD, photomultiplier, photon counting mode). Spectral sensitivity calibration methods. Radiation sources. Lasers (laser generation conditions, optical resonator, best known lasers and special laser systems). Properties of laser radiation. Examples of laser applications.

Recommended literature:
General physics: 3: optics / Anton Štrba. Bratislava: Alfa, 1979
Light: Waves, rays, photons / Anton Štrba, Vladimír Mesároš, Dagmar Senderáková. Nitra: Enigma, 2011

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 35

A	B	C	D	E	FX
54,29	22,86	8,57	5,71	8,57	0,0

Lecturers: prof. RNDr. Pavel Veis, CSc., Mgr. Michaela Horňáčková, PhD.

Last change: 18.02.2022
Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 3

Recommended semester: 3.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

english

Notes:

Past grade distribution
Total number of evaluated students: 115

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

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

Last change: 18.06.2022

Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-111/00	Plasma Diagnostics

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:
Exam: Oral
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Overview of diagnostic methods in plasma physics and understanding their basic principles.

Class syllabus:
Basic tasks of plasma diagnostics: determination of temperature and electron density, neutral gas temperature, density of radicals and metastable states. Optical plasma diagnostics: optical emission spectroscopy, laser absorption spectroscopy (CRDS, CEAS), absolute and relative methods of atomic radicals density determination (actinometry, titration, VUV abs.,…). laser-induced methods (LIBS, LIF), diagnostics from broadening and shifts of spectral lines, scattering methods (Ramanov, Thomson scattering, CARS), determination of rotational, vibrational temperatures of molecular radicals.
Electrical measurements: oscilloscope- voltage and current measurements, Impedance measurements, Rogowski probe, high-voltage probe, synchronization of measured signals, coaxial cable adjustment. Invasive plasma diagnostics: Simple electric (Langmuir) probe: characteristics, determination of plasma parameters from experimental data obtained by the probes. Plasma boundary layer, restrictions on the use of probes. Double probe, probes at a floating potential, magnetic probes
Particle plasma diagnostics: Mass spectroscopy: mass spectrometers (static and dynamic). Ion detection methods. Use of mass spectrometry for diagnostics of plasma parameters, measurement of cross-sections. Ion mobility spectroscopy (IMS). High-frequency plasma diagnostics: principles, plasma in a waveguide, resonators, elements of microwave diagnostics

Recommended literature:
I. Hutchinson: Principles of Plasma Diagnostics, Cambridge Unibersity Press 2002 .Francis Chen: Introduction to Plasma Physics, Springer

Languages necessary to complete the course:

english

Notes:

Past grade distribution
Total number of evaluated students: 64

A	B	C	D	E	FX
67,19	20,31	12,5	0,0	0,0	0,0

Lecturers: prof. RNDr. Pavel Veis, CSc., doc. RNDr. Matej Klas, PhD.

Last change: 23.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KEF/2-FFP-954/15	**Course title:** Plasma Physics
Number of credits: 6	
Educational level: II.	
Course requirements: Approximate grade levels: A 90%, B 80%, C 70%, D 60%, E 50% Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The result of the course is state final exam.	
Class syllabus: State final exam in Plasma physics programme is composed of three fields of study: Plasma and basics diagnostics of plasma. Gas discharges and their applications Vacuum physics	
State exam syllabus: Plasma and basics diagnostics of plasma P001. Interaction of plasma with walls, ambipolar diffusion. P002. Plasma in thermodynamic equilibrium, Saha equation. P003. The concept of plasma frequency, interaction of electromagnetic waves with plasma P004. Diagnostic methods in plasma (probes, OES, microwave diagnostics) P005. Processes of ionization of neutral particles, recombination of electrons and ions, excitation of atoms and molecules. P006. Kinetic equations of plasma - kinetic description of plasma. P007. Concept of collision cross-sections, collision frequency, energy transfer in collisions. P008. Mobility of electrons and ions, Einstein equation for charged particle diffusion. P009. Principles of thermonuclear synthesis. P010. Definition of plasma, quasi-neutrality, Debye shielding radius. Gas discharges and their applications VA001. Discharge ignition, electron avalanche, Townsend discharge. VA002. Corona discharge and its applications. VA003. Radiofrequency discharge and its application. VA004. Plasma utilization for surface modification. VA005. Spark and arc discharge and its application. VA006. Dielectric barrier discharges and its application. VA007. Streamer theory. VA008. Glow discharge and its inter-electrode areas. VA009. Schottky's Positive Column Theory. VA010. Paschen law. Discharge breakdown condition. Vacuum physics VF001. Maxwell distribution of particles according to their speed, derivation of formula for gas pressure.	

VF002. Ideal gas equation, mean free path in the mixture of gases, collision frequency.
VF003. Transport phenomena in gases (diffusion, thermal conductivity, viscosity).
VF004. Types of vacuum (low, medium, high, ultrahigh).
VF005. Methods of generating low pressures, vacuum pumps types (rotary, diffuse, ion-sorption, molecular, etc.).
VF006. Pressure measurement methods, types of manometers (ionization, resistance, thermistor, etc.).
VF007. Diffusion of gases through compact matter, physical and chemical adsorption of gases, detection of vacuum leaks.
VF008. Gas flow, tube conductivity for molecular and viscous flow.
VF009. Measurement methods of pumping speed.
VF010. Mass spectrometers principles.

Recommended literature:
Fundamentals of plasma physics / J. A. Bittencourt. New York : Springer, 2004

Languages necessary to complete the course:
english

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-101/15	Plasma Physics (1)

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

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Exam: written test and oral exam.
Grading scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
The students will gain fundamental knowledge on plasma physics. They will understand significance and relations of the basic plasma parameters. They will be able to mathematically formulate and solve basic problems in plasma physics, especially in low temperature plasmas.

Class syllabus:
Debye-Hückel theory of charge shielding, quasi-neutrality of plasma, plasma frequency. Mobility of charged particles in gases. Fluid model of plasma, momentum transfer equation. Diffusion of charged particles in gases. Conductivity of plasma in stationary and alternating electric field. Plasma permittivity, propagation of electromagnetic waves in plasma. Plasma-wall interactions, ambipolar diffusion, Shottky theory, electric sheath. Generation of plasma. Saha equation. Townsend discharge. Paschen law. Types of self-sustained discharges. Langmuir probe. Introduction to controlled thermonuclear reaction.

Recommended literature:
Yu. P. Raizer: Gas Discharge Physics, Springer, 1997.
Michael A. Lieberman, Allan J. Lichtenberg: Principles of plasma discharges and material processing, Wiley, 1994.
J. A. Bittencourt: Fundamentals of Plasma Physics, Springer, New York, 2004.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
43,24	21,62	13,51	10,81	2,7	8,11

Lecturers: prof. Dr. Štefan Matejčík, DrSc., Mgr. Michal Stano, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-102/15	Plasma Physics (2)

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

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

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

Learning outcomes:
The students obtain the capabilities necessary for conducting research in plasma fundamentals and technologies.

Class syllabus:
Movement of individual charged particles in E, B fields, simple kinetic theory from the averaged kinetic equation, electron energy distribution function (EEDF), quantities computable from EEDF, methods of determining EEDF.
Boltzman kinetic equation (BKR), BKR variants depending on the collision term, solution of BKR in weakly ionized plasma, Morgenau and Druyvesteyn electron energy distribution, BKR in collision-less plasma - Vlasov equation, BKR in strongly ionized plasma - Fokker-Planck equation, Coulomb cross section, Coulomb logarithm, numerical solution of Boltzman's equation.
Monte Carlo (MC) simulations of charged particle dynamics, use of MC method to determine steady-state and time dependent EEDF (electron energy distribution function), kinetics and reactions of ions in plasma.

Recommended literature:
Kinetic Processes in Gases and Plasmas / edited by A. R. Hochstim. New York : Academic Press, 1969
Molecular quantum mechanics / Peter Atkins, Ronald Friedman. Oxford : Oxford University Press, 2005
Exploring Chemistry with Electronic Structure Methods / James B. Foresman, AEleen Frisch. Gaussian, Inc, 1993, 1995-96, 2015

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
82,76	10,34	6,9	0,0	0,0	0,0

Lecturers: doc. RNDr. Mário Janda, PhD., doc. Mgr. Peter Čermák, PhD., doc. RNDr. Veronika Medvecká, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FOL-112/15	Plasma Radiation

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:
Exam: oral
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Extension of knowledge in the field of plasma physics, the importance of the study of plasma radiation for diagnostic and application goals. The student will gain theoretical knowledge in the field of formation and propagation of radiation in plasma, the interaction of radiation with plasma and the principles of spectroscopic methods in plasma, which can be used in practice in optical diagnostics of plasma.

Class syllabus:
Introduction to the plasma radiation, the importance of the study of optical methods, el-mag. spectrum, basic concepts. Thermodynamic equilibrium in plasma. Conditions for the existence of thermodynamic equilibrium. Local thermodynamic equilibrium (LTE). Collisional processes - their impact on the occupancy of energy levels. Interaction of radiation with plasma. Transitions between discrete energy levels. Einstein coefficients. Bound-free transition (photoionization). Free-bound (recombination with radiation). Free-free transition (absorption and emission in the continuum - bremsstrahlung). Transport of radiation from inside the plasma beyond its borders. Radiation transfer equation. Solution of the radiation transfer equation in LTE. Spectral line profile, broadening of spectral lines in plasma. Combined effects on profiles. Utilization of radiation in plasma. Identification of radiating atoms and molecules. Fundamentals of molecular spectroscopy. Continuous spectrum. Continuous spectrum diagnostics. Measurement methods, experimental technique. Basic requirements of the experiment, radiation detectors, accessories.

Recommended literature:
Methods of experimental Physics / n Volume 9 : Plasma Physics Part B / Edited by: Hans R. Griem, Ralph H. Lovberg. New York : Academic Press, 1971
J. Michael Hollas: Modern Spectroscopy, John Wiley, 2004
G. V. Marr: Plasma Spectroscopy, Elsevier, 1968

Electronic texts of the lecturers. Current articles from the area.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 34

A	B	C	D	E	FX
94,12	2,94	2,94	0,0	0,0	0,0

Lecturers: doc. RNDr. Veronika Medvecká, PhD., doc. RNDr. Anna Zahoranová, PhD., doc. RNDr. Mário Janda, PhD.

Last change: 30.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-205/15	Plasma Utilisation

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

Number of credits: 4

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: individual tasks, analyses of scientific papers
Exam: oral
Approximate grade evaluation levels: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Use and improvement of theoretical knowledge in the field of plasma physics. Students will be able to use the gained knowledge for introducing new plasma technologies in application (microelectronics, surface modification, nanotechnologies, biomedicine, environmental applications, new energy sources).

Class syllabus:
Basic mechanisms of plasma generation. Plasma chemical reactions, homogeneous and heterogeneous.
Technical plasma sources. Classification of plasma technologies.
Surface treatment, plasma deposition, plasma implantation. Plasma technologies in microelectronics, plasmachemical and ion-reactive etching.
Plasma technologies for sterilization and biomedical applications, biocompatibility of implants, antimicrobial surface treatment.
Plasma technologies for environmental protection, removal of gaseous pollutants, solid particles, water purification.
New energy sources, fusion, ITER.

Recommended literature:
Fundamentals of plasma physics / J. A. Bittencourt. New York : Springer, 2004
A. Fridman, Plasma medicine, Wiley 2013

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 27

A	B	C	D	E	FX
81,48	11,11	7,41	0,0	0,0	0,0

Lecturers: doc. RNDr. Juraj Országh, PhD., doc. RNDr. Miroslav Zahoran, CSc., doc. RNDr. Anna Zahoranová, PhD., doc. RNDr. Karol Hensel, PhD., prof. RNDr. Zdenko Machala, DrSc.

Last change: 23.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-234/22	Plasma-Chemical Methods of Surface Treatment

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

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KEF/2-FFP-234/15

Course requirements:
Continuous evaluation: the preparation of a presentation on a given topic from the current scientific journal literature
Exam: exam
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the lectures, students will be able to independently assess the suitability of plasma surface treatment for a given material, choose the optimal type of plasma source and its operating conditions, as well as the method of diagnostics of surface changes. Deepening knowledge of plasma technologies, plasma sources, suitable surface analytical methods and current trends in the field of surface treatment of materials using plasma.

Class syllabus:
Basics of plasma chemistry, sources of non-isothermal plasma at low and atmospheric pressure and their application in surface treatment; generation of non-isothermal plasma at atmospheric pressure using dielectric barrier discharges and impulse discharges, plasma-surface interaction, formation of polar surface groups, hydrophilic surface treatment of polymeric materials with non-isothermal plasma, analytical methods of surface changes – the strike-through time, contact angle, determination of surface energy by contact angle measurement using commercial equipment, determination of surface energy by the Critical Wetting Surface Tension method, wicking tests, characterization of chemical changes on the surface by the FTIR method; hydrophobic surface treatments of polymers, post-treatments of plasma-activated polymer surfaces - plasma-initiated grafting in liquid and gas phase, plasma polymerization; aging of surface treatments; plasma surface treatment of nonwovens, polymer films (printing, adhesion, flexible electronics), glass, silicon, wafers, wood, inorganic nanofibers, metals, plasma interaction with plant seeds and cells; selective plasma etching; demonstration of pilot application tests of plasma technologies, developed within

the research and development activities at the faculty, in the real environment of production lines in industry.

Recommended literature:

Alexander Fridman: Plasma Chemistry, Cambridge, University Press, 2008
Non-Equilibrium air plasmas at atmospheric pressure / edited by K. H. Becker ... [et al.]. Bristol: Institute of Physics Publishing, 2005
Plasma physic and engineering / Alexander Fridman, Lawrence A. Kennedy. New York : Taylor & Francis, 2004
Advenced Plasma Technology/ed. by R. d´Agostino, P. Favia, Y. Kawai, H. Ikegami, vyd. Wiley-VCH, 2008
Plasma technologies for textiles / edited by R. Shishoo, Woodhead Publishing Limited, 2007
Own electronic texts of the lecturer published through the subject's website.
Selection of current articles from the area.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 1

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

Lecturers: doc. Mgr. Dušan Kováčik, PhD., doc. RNDr. Anna Zahoranová, PhD., doc. RNDr. Veronika Medvecká, PhD., Mgr. Petra Šrámková, PhD.

Last change: 21.06.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-115/15	Practical Exercises in Vacuum and Plasma Physics

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

Number of credits: 4

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Assessment during the semester: control of preparation for the internship, papers from internships
Approximate evaluation grades: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Gaining practical experience from basic experimental methods of plasma physics and properties of vacuum devices.

Class syllabus:
Measuring the pumping speed of vacuum pumps. Low pressure measurement, vacuum gauge calibration. Preparation of thin layers. Measurement of zeolite properties. Verification of Paschen's law. Determination of cathode gradient. Measurement of electron temperature and electron concentration by single and double electric probe methods. Measurement of corona discharge characteristics. Measurement of ion mobility. Measurement of work function of metals.

Recommended literature:

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 28

A	B	C	D	E	FX
78,57	17,86	0,0	3,57	0,0	0,0

Lecturers: Mgr. Michal Stano, PhD., doc. RNDr. Juraj Országh, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-230/10	Selected Topics in High Temperature Plasma

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:
Exam: oral
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course, the student will acquire theoretical, physical and technical knowledge in the field of high-temperature plasma, especially in the field of TOKAMAK physics.

Class syllabus:
Motion of charged particles in electric and magnetic fields, combined fields, plasma generation, plasma equilibrium and stability, plasma confinement, physics and techniques of TOKAMAK, experiment control, diagnostic methods (probes, Thomson scattering, neutral Li beam, neutral particles, ...) , plasma heating (RF, microwave, neutral beam)

Recommended literature:
Plasma Physics and Fusion Energy, Jeffrey Freidberg, Cambidge University Press 2007

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 29

A	B	C	D	E	FX
86,21	10,34	3,45	0,0	0,0	0,0

Lecturers: RNDr. Radomír Pánek, PhD.

Last change: 31.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-123/15	Semester Project

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

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

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

Learning outcomes:
The student will learn the basics of systematic work on one topic, which he / she will study from professional book and article literature and will create a scientific output based on scientific research activities under the guidance of a supervisor.

Class syllabus:
The projects will focus on the physics of plasma and electric discharges. Within the project, the student will develop an experimental or theoretical method related to plasma physics, or electric discharges, or their applications. The obtained results will be processed in written form in the range of about 10-15 pages.

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 28

A	B	C	D	E	FX
92,86	3,57	0,0	0,0	0,0	3,57

Lecturers: prof. Dr. Štefan Matejčík, DrSc.

Last change: 23.01.2022

Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FOL-210/00	Special Practical in Optical Spectroscopy

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

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Mastering experimental methods of optical spectroscopy directly on devices where scientific projects are solved by research teams of the Department of Plasma Physics and the Department of Optics.

Class syllabus:
Visible and infrared spectroscopy – prism and grating spectrometers, photomultiplier, CCD detector, calibration of a spectrometer, time-resolved spectroscopy, actinometry, determination of rotational and vibrational temperatures of diatomic molecules. Spectroscopy in vacuum ultraviolet range. Cavity ring-down spectroscopy. Echelett spectrometer.

Recommended literature:
A. Beiser, Úvod do moderní fyziky, Academia, Praha 1978
G.V. Maar: Plasma Spectroscopy, Elsevier Amsterdam 1968
Scientific papers

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 21

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

Lecturers: Mgr. Michaela Horňáčková, PhD., prof. RNDr. Pavel Veis, CSc., M.Sc. Sahithya Atikukke, PhD.

Last change: 18.02.2022
Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-235/22	Spectroscopy of Electron-Molecular Processes

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

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Assessment during the semester: control of preparation for laboratory work, reports of laboratory work
Approximate evaluation grades: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Gaining practical experience of electron-molecular experimental methods in plasma physics, experiment of electron-induced fluorescence in the visible and ultraviolet region, experiment of mass spectrometry of molecules, molecular clusters, photoelectron spectrometry.

Class syllabus:
Measurement of effective cross sections of electron-induced elementary processes. Fluorescence spectra, emission effective cross sections. Mass spectra, effective cross sections of ionization reactions, formation of positive ions, formation of negative ions.

Recommended literature:
Illenberger E, Momigny J (1992) Gaseous Molecular Ions. Steinkopff, Heidelberg
Ingólfsson O (2019) Low-Energy Electrons. Jenny Stanford Publishing
Hollas J M (2004) Modern Spectroscopy, 4th ed. John Wiley & Sons, Ltd.
Selection of current articles from the area.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 2

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

Lecturers: doc. RNDr. Juraj Országh, PhD., doc. RNDr. Peter Papp, PhD.

Last change: 02.02.2022
Approved by: prof. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, 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. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-TEF-112/22	Treatment of Experimental Data

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

Number of credits: 3

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
The student will master the theoretical principles and gain practical experience in evaluating data from physical experiments using "data flow" programming.

Class syllabus:
Sources of measurement uncertainties. Characteristics of statistical files (averages, dispersion,…). Dispersion folding rule, correlation coefficient. Spreading uncertainties. Evaluation of functional dependencies, nonlinear scales on graph axes, center of gravity method of finding the most probable form of the measured dependence, spline curves. Least squares method for straight line, and generally linear and nonlinear functions, weighting coefficients. Calibration by regression method, prediction bands, uncertainty of the quantity determined from the calibration curve, critical level, detection limits.

Recommended literature:

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
46,67	13,33	0,0	0,0	33,33	6,67

Lecturers: doc. Mgr. Peter Čermák, PhD.

Last change: 02.02.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/2-FFP-109/15	Vacuum Physics and Technology

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

Number of credits: 4

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation during semester: individual work
Approximate grade scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
The result of the training will be theoretical and practical knowledge about the methods of obtaining, maintaining and measuring low pressures in the range of 105 to 10-13 Pa, in the field of gas flow, as well as in the field of materials suitable for low pressure physics.
Students will gain knowledge enabling the design of vacuum equipment for scientific and technical equipment, select appropriate technical solutions (vacuum pumps, chambers, vacuum gauges).

Class syllabus:
Introduction to vacuum physics (historical overview, basic concepts, vacuum distribution, talc units). Kinetic theory of gases. Gas flow in viscous mode, mixed mode and molecular mode. Transmission phenomena in gases (diffusion, heat conduction). Processes taking place on the walls of vacuum systems (physical, chemical adsorption, absorption). Pumping process theory. Mechanical and dry pumps. Turbomolecular and diffusion pumps. Ionic and cryogenic pumps. Methods of measuring the pumping speed of the pump. Vacuum gauges. Measurement of partial pressures. Leak detection of vacuum systems. Selection of materials for vacuum technology. Design of vacuum apparatus.

Recommended literature:
Ch. Edelman, Vakuumphysik, Spektrum, Heidelberg, 1998

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 55

A	B	C	D	E	FX
90,91	9,09	0,0	0,0	0,0	0,0

Lecturers: prof. Dr. Štefan Matejčík, DrSc., Mgr. Michal Stano, PhD.

Last change: 31.01.2022

Approved by: prof. Dr. Štefan Matejčík, DrSc.