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-FOL-217/15	Analysis of Surfaces and thin Layers Using Electromagnetic 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: 1.

Educational level: II.

Prerequisites:

Course requirements:
Final assessment: 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 learn the basics of characterization of material surfaces and thin films using IR / NIR / VIS / UV / soft- and hard X-ray.

Class syllabus:
Overview of experimental techniques for the analysis of surfaces and thin layers of materials using electromagnetic radiation. The lecture will be an introduction to the following experimental techniques: spectroscopic and imaging ellipsometry, optical profilometry, dynamic and static scattering, confocal Raman / fluorescence microscopy, X-ray reflectometry and scattering. Comparison with touch techniques of surface analysis. Finally, I will introduce techniques of surface modification by laser radiation. The lecture will include practical demonstrations of the above experimental techniques at the Institute of Physics of the Slovak Academy of Sciences.

Recommended literature:
Gamma- nd X-Ray spectrometry with semiconductor detectors / Klaus Debertin, Richard G. Helmer. Amsterdam: Elsevier, 1988
Molecular spectra and molecular structure: volume 2: Infrared and raman spectra of polyatomic molecules / Gerhard Herzberg. New York: D. Van Nostrand Company, 1949
• Selection of current articles from the area

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 13

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

Lecturers: doc. RNDr. Tomáš Roch, Dr. techn., Dr. rer. nat. Peter Šiffalovič, DrSc., doc. Mgr. Róbert Breier, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 6

Recommended semester:

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 22

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

Lecturers: prof. Ing. Igor Farkaš, Dr.

Last change:

Approved by: prof. RNDr. Pavel Veis, CSc.

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-113/15	Atomic and Molecular Structure

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:

Antirequisites: FMFI.KEF/2-FOL-113/00

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:
After completing the course, the student will have the theoretical foundations of optical spectroscopy of atoms and diatomic molecules. They will learn to interpret basic atomic electron spectra and molecular vibrational spectra.

Class syllabus:
Atom structure, atomic spectra. Structure and symmetry of molecules. Molecular orbitals, LCAO. Rotational-vibrational structure of a diatomic molecule, quantum numbers and energy levels - harmonic oscillator, anharmonic oscillator, Morse potential, rigid rotor, flexible vibrating rotor.
IR and Raman molecular spectra, intensities in rotational-vibrational spectra. Electron states and electron transitions - potential curves, vibrational structure, rotational structure, Franck-Condon principle, classification of electron states, multiplets, Hund cases, selection rules, allowed transitions, forbidden transitions, perturbations, Zeeman and Stark phenomenon, hyperfine structure. Synthetic molecular spectra.

Recommended literature:
Molecular spectroscopy / Zuzana Chorvátová. Bratislava: Comenius University, 1987
Kolebanija molekuul / M. V. Volkenštejn ... [et al.]. Moscow: Science, 1972
Molecular vibrational / rotational / spectra / Dušan Papoušek, Mamed Ragimovich Aliev. Prague: Academia, 1982

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 29

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

Lecturers: Matej Veis, PhD., doc. RNDr. Mário Janda, PhD.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-116/15	Basic Electronics

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

Number of credits: 7

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Continuous assessment: work on practical exercises (100%). The condition for granting credits is the presentation of a semester project.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The student will understand the principles of using basic building blocks (resistor, inductance, capacitance, diode, transistor) in digital and analog circuits. They will understand the principles and use of basic digital and analog circuits (gates, counters, timers, operational amplifier, A / D and D / A converters, Arduino microprocessor system), principles of generating harmonic and non-harmonic signals and linear and pulse power supplies. They will be able to analyze basic circuits and use them to design simple electronic circuits with the required functionality. He will also gain practical experience with the construction and revitalization of simple electronic circuits.

Class syllabus:
Semiconductor diode and transistor and their basic connections. Transistor in switching mode, TTL digital circuits and their use. Basic logic circuits. Comparator. Timer 555. D / A and A / D converters. Arduino microprocessor system. Nodal potential method. Analysis of linear circuits in time and frequency domain. Linear model of transistor and operational amplifier. Basic circuits with operational amplifier. Positive feedback and oscillator principles. Power supplies and rectifiers.

Recommended literature:
The art of electronics / Paul Horowitz, Winfield Hill. New York : Cambridge University Press, 1989

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 132

A	B	C	D	E	FX
96,21	0,0	3,03	0,0	0,0	0,76

Lecturers: doc. RNDr. František Kundracik, CSc., doc. RNDr. Matej Klas, PhD., doc. RNDr. Juraj Országh, PhD.

Last change: 27.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-231/00	Design of Optical Systems

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

Number of credits: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework
Examination: oral examination
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
The student will gain an overview of the basic principles accompanying the design of optical systems and an overview of available software used for this purpose. He will also gain knowledge about the properties of materials for optics and their impact on optical systems.

Class syllabus:
Optical design - principles and general procedure. Basic optical systems and devices, apertures, optical aberrations. Design of some specific optical systems using software. Measurement and control of basic parameters of optical systems. Commercial software (OSLO).

Recommended literature:
Svetlo: Vlny, lúče, fotóny / Anton Štrba, Vladimír Mesároš, Dagmar Senderáková. Nitra : Enigma, 2011
Modern Optical Engineering (The design of Optical Systems) / Warren J. Smith. McGraw-Hill Education; 4th edition 2007

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 7

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

Lecturers: doc. Mgr. Peter Čermák, PhD.

Last change: 18.02.2022
Approved by: prof. RNDr. Pavel Veis, CSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KEF/2-FOL-991/15	**Course title:** Diploma Thesis Defense
Number of credits: 10	
Educational level: II.	
Course requirements: Exam: oral Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The result of successful completion of the state subject will be the defense of the diploma thesis. By completing this course, the student will demonstrate the ability of scientific work under the guidance of a supervisor, the ability to solve problems in the field of laser physics, optics and optical spectroscopy, present them to the professional public and defend the results.	
Class syllabus: After the elaboration of the diploma thesis under the guidance of the thesis supervisor, the student submits it and prepares for the defense. They will get acquainted with the opinions of the opponents on their work and will prepare the defense of the diploma thesis and the answers to the opponents' questions. After the defense of the diploma thesis before the commission, he answers the comments and questions from the reviews, he participates in the discussion about the meaning and main results of his work.	
State exam syllabus:	
Languages necessary to complete the course: English	
Last change: 18.02.2022	
Approved by: prof. RNDr. Pavel Veis, CSc.	

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-921/22	Diploma Thesis Seminar (1)

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

Number of credits: 1

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: Independent preparation, presentation at seminars.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Systematic preparation for writing a diploma thesis, mastering methodical procedures for preparing a diploma thesis, gaining an overview of available sources of information on professional issues, the current state of solving the topic of your thesis and gaining experience in preparing and presenting papers on professional topics.

Class syllabus:
Study of current scientific publications in the field of laser physics and optical spectroscopy, analysis of scientific publications, analysis of experimental and scientific results obtained within the solution of the diploma thesis, comparison of results, presentation of results, critical discussion.

Recommended literature:
How to write university and qualification theses: How to write seminar theses, year theses, student scientific and professional work, diploma theses, final and attestation theses, dissertations / Dušan Katuščák. Bratislava: Stimul, 1998
Processing and evaluation of measurements / Gejza Wimmer, Rudolf Palenčár, Viktor Witkovský. Bratislava: Veda, 2002
Experimental data processing / František Kundracik, Jozef Masarik, Štefan Dubnička. Bratislava: Comenius University, 1999
• Selection of current articles in the field of laser physics and optical spectroscopy.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 5

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

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-922/22	Diploma Thesis Seminar (2)

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

Number of credits: 1

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: Independent preparation, presentation at seminars.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Systematic preparation for the defense of the diploma thesis, which will result in improving the students 'ability to present the results, increase students' ability to explain and defend their work.

Class syllabus:
Seminar II. will be conducted in English. Presentation of current scientific knowledge in the field of laser physics and optical spectroscopy, presentation of own results obtained in solving the thesis.

Recommended literature:
How to write university and qualification theses: How to write seminar theses, year theses, student scientific and professional work, diploma theses, final and attestation theses, dissertations / Dušan Katuščák. Bratislava: Stimul, 1998
Processing and evaluation of measurements / Gejza Wimmer, Rudolf Palenčár, Viktor Witkovský. Bratislava: Veda, 2002
Experimental data processing / František Kundracik, Jozef Masarik, Štefan Dubnička. Bratislava: Comenius University, 1999
Selection of current articles in the field of laser physics and optical spectroscopy.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: doc. RNDr. Mário Janda, PhD.
Last change: 18.02.2022
Approved by: prof. RNDr. Pavel Veis, CSc.

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. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: II.

Prerequisites:

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

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

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

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

Languages necessary to complete the course:
Slovak or English

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

Past grade distribution
Total number of evaluated students: 95

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

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: II.

Prerequisites:

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

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

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

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

Languages necessary to complete the course:
Slovak or English

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

Past grade distribution
Total number of evaluated students: 95

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

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

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

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 291

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

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

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

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Aneta Barnes

Last change: 11.04.2024
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 482

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 307

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 120

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

Learning outcomes:

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 79

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

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-110/09	Fundamentals of Laser Spectroscopy

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

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

Learning outcomes:
After completing the course, the student will have knowledge of several laser spectroscopic methods and their advantages over classical spectroscopic methods. He will know in which applications these methods can be used.

Class syllabus:
Comparison of classical and absorption spectroscopic methods, explanation of why it is advantageous to use a laser. Absorption path extension, optical resonator. Laser - in terms of its usability in spectroscopy. Intercavity laser induced spectroscopy (ICLAS). Cavity enhanced absorption spectroscopy (CEAS). Pulsed-CRDS. Continuous wave CRDS (CW-CRDS). Laser induced fluorescence spectroscopy (LIF). Two-photon absorption laser induced fluorescence (TALIF). Laser photoionization spectroscopy (FIS). Laser Raman spectroscopy (LRS). Coherent-Antistokes Raman Scattering (CARS). Thomson scattering and use for plasma diagnostics.

Recommended literature:
Laserová spektroskopia / Zuzana Chorvátová. Bratislava : Univerzita Komenského, 1992
Laser spectroscopy : Basic concepts and instrumentation / Wolfgang Demtröder. Berlin : Springer, 1981
Optics and lasers : Including fibers and optical waveguides / Matt Young. Berlin : Springer, 2000

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
77,78	22,22	0,0	0,0	0,0	0,0

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

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/2-FOZ-215/22	Gas Discharges and their Applications

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:

Antirequisites: FMFI.KAFZM/1-OZE-272/15

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

Learning outcomes:
By completing the course, the student will gain knowledge of the physics of electric discharges and plasmas and its applications in various fields.

Class syllabus:
Basic characteristics of plasma. Methods of plasma generation. Advantages of using electric discharges for plasma generation. Overview of the basic types of discharges (glow, corona, arc, spark, dielectric barrier discharge). Formation of discharges: statistical theory of electric discharges, statistical model of electron avalanche, statistical model of ignition of electric discharges at low pressures. Discharge formation at higher pressures: streamer description. Gas breakdown at higher pressures, plasma transition from low to high ionization. Discharges in contact with and in water. Environmental applications - air purification (gases and particulates), water and waste disposal. Biological and medical applications - bio-decontamination and sterilisation, tissue and surface treatment, wound healing, cancer treatment and other therapies. Agricultural applications - seed germination, plant growth, nitrogen fixation and fertiliser treatment. Energy applications - fuel reforming and hydrogen generation, plasma assisted combustion and ignition, electromagnetic shielding, thermonuclear fusion. Materials applications - welding, cutting, etching, deposition and implantation. Optical applications - radiation sources, plasma displays, xerox, lasers, gas analysers.

Recommended literature:
V. Martišovitš: Základy fyziky plazmy, Bratislava (2006)
Y. Raizer: Gas discharges, Springer (1991)
P. K. Chu and X. P. Lu: Low temperature plasma technology, CRC Press (2014)

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

Notes:

Past grade distribution
Total number of evaluated students: 8

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

Lecturers: doc. RNDr. Mário Janda, PhD., prof. RNDr. Zdenko Machala, DrSc., doc. RNDr. Karol Hensel, PhD.

Last change: 08.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 828

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 541

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 184

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 104

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

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

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-914/22	Individual Work on Diploma Thesis (1)

Educational activities:
Type of activities: independent work
Number of hours:
per week: **per level/semester:** 100s
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: Control of the implementation of the set stages, presentation at the seminar of the department, resp. expert group.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Acquisition of practical knowledge for independent scientific work., Mastering the methods to achieve the objectives of the thesis.

Class syllabus:
Under the guidance of the thesis supervisor, the student will work experimentally or theoretically on the thesis project at the thesis supervisor's workplace or partly at another workplace designated by the thesis supervisor. The student acquires skills and knowledge related to the assignment of the diploma thesis, gets acquainted with the methods, procedures and techniques related to the solution of the diploma 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
Processing and evaluation of measurements / Gejza Wimmer, Rudolf Palenčár, Viktor Witkovský. Bratislava: Veda, 2002
Fundamentals of Physical Measurements I / Jaromír Brož ... [et al.]. Prague: Státní pedagogické nakladatelství, 1983

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-915/22	Individual Work on Diploma Thesis (2)

Educational activities:
Type of activities: independent work
Number of hours:
per week: **per level/semester:** 100s
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: Control of the implementation of the set stages, presentation at the seminar of the department, resp. expert group.
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Further elaboration of the diploma thesis. The student will master the methods of scientific work, gain theoretical and experimental skills.

Class syllabus:
The student participates in scientific work related to the assignment of the diploma thesis, performs theoretical tasks and / or experimental measurements related to the solution of the diploma thesis, consults the results with the supervisor, prepares parts of the diploma 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, 1971
Processing and evaluation of measurements / Gejza Wimmer, Rudolf Palenčár, Viktor Witkovský. Bratislava: Veda, 2002
Fundamentals of Physical Measurements I / Jaromír Brož ... [et al.]. Prague: Státní pedagogické nakladatelství, 1983

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: prof. RNDr. Pavel Veis, CSc.
Last change: 18.02.2022
Approved by: prof. RNDr. Pavel Veis, CSc.

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-916/22	Individual Work on Diploma Thesis (3)

Educational activities:
Type of activities: independent work
Number of hours:
per week: **per level/semester:** 60s
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: Checking the status of the diploma thesis
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The student will write a diploma thesis that will meet all the attributes of the diploma thesis, and thus create a prerequisite for the successful defense of the diploma thesis at the state final exam.

Class syllabus:
The student participates in the scientific work related to the assignment of the diploma thesis, completes the tasks related to the solution of the diploma thesis, analyzes the results, but at this stage he is increasingly engaged in writing the diploma thesis, editing it in the final form.

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
Processing and evaluation of measurements / Gejza Wimmer, Rudolf Palenčár, Viktor Witkovský. Bratislava: Veda, 2002
Fundamentals of Physical Measurements I / Jaromír Brož ... [et al.]. Prague: Státní pedagogické nakladatelství, 1983

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 18.02.2022
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 5

Recommended semester: 1., 7.

Educational level: II.

Prerequisites:

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

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

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

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

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

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 8

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

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

Last change: 22.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/1-OZE-377/22	Introduction to Plasma Physics and Electrical Discharges

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: I., II.

Prerequisites: FMFI.KEF/1-FYZ-217/22 - Electromagnetism

Antirequisites: FMFI.KEF/1-FYZ-451/15

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: doc. RNDr. Mário Janda, PhD.

Last change: 21.12.2021

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KEF/1-FYZ-452/22	Introduction to Solid State Physics

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

Number of credits: 7

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KEF/1-FYZ-452/18

Course requirements:
Continuous assessment: homework, 2 papers
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): Weight of the intermediate / final evaluation: 100/0

Learning outcomes:
After completing the course, students will be actively acquainted with the following basic concepts of solid state physics: ideal crystal, reciprocal space, phonon spectrum, electron band structure and Fermi surface. They will also know how these concepts enter into the simplest analyzes of the thermal, electrical and optical properties of solids.

Class syllabus:
Symmetry classification of substances. Van der Waals-London bond. Liquid-gas transition. Crystals with van der Waals and ionic bonding. Basics of crystallography. Surface tension and nucleation. Diffraction experiments and reciprocal space. Classical and quantum lattice oscillations theory. Metal binding. Chemical bonding. Electron spectrum in an ideal crystal: tight bond method, Bloch's theorem, difference between metals and insulators. Transport phenomena: phenomenological description, Boltzmann's equation. Semiconductors and semiconductor electronics. Response to time-varying fields. Elementary models of dielectric function.

Recommended literature:
http://www.st.fmph.uniba.sk/~hlubina1/
Condensed matter physics : Corrected printing / Michael P. Marder. John Wiley, 2000
Solid-State Physics / H. Ibach, H. Lüth. Springer, 2003
Úvod do fyziky pevných látek / Charles Kittel. Academia, 1985

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 15

A	B	C	D	E	FX
46,67	13,33	6,67	0,0	26,67	6,67

Lecturers: doc. RNDr. Richard Hlubina, DrSc., Mgr. František Herman, PhD.

Last change: 24.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-237/15	Laser Applications, Processes and Diagnostics

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:

Antirequisites: FMFI.KEF/2-FOL-237/09

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

Learning outcomes:
After completing the lecture, the student should be acquainted with
issues of the latest trends in laser-assisted production and modification of materials.

Class syllabus:
Use of lasers for surface analysis.
Laser ablation in combination with inductively coupled palms (LA ICP MS, LA ICP OES).
Laser-induced spark spectroscopy and its use.
Micro-Raman spectroscopy (composition determination, surface determination
temperatures from the ratios of Stokes and anti-Stokes spectra).
Use of lasers for surface treatment (etching, PLD deposition). Use of lasers in metallurgy.
Thermal, photophysical and photochemical processes. Reaction kinetics and particle transport. Atomization and formation of clusters.
Surface melting processes. Material evaporation and plasma formation processes. Material deposition. Transformation and synthesis
material, creation of structures. Measurement and diagnostic techniques.

Recommended literature:
Laser spectroscopy : Basic concepts and instrumentation / Wolfgang Demtröder. Berlin : Springer, 1981
Svetlo : Vlny, lúče, fotóny / Anton Štrba, Vladimír Mesároš, Dagmar Senderáková. Nitra : Enigma, 2011
Selection of current articles from the area.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 9

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

Lecturers: prof. RNDr. Pavel Veis, CSc., doc. RNDr. Mário Janda, PhD., M.Sc. Sahithya Atikukke, PhD.

Last change: 17.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-218/22	Laser Chemistry

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

Learning outcomes:
After completing the course, students will develop theoretical and practical skills in instrumental techniques. Students will be able to plan experiments according to established theoretical or experimental models and use computer programs that allow to compile and solve chemical problems In addition, they will develop theoretical and practical skills for the characterization and analysis of various chemicals and materials. This course presents a series of techniques and applications used in various branches of science and technology. Due to its strong interdisciplinary nature, this topic is very important for the preparation of a scientist who intends to gain a general idea of the usefulness of lasers in current science, while being of great interest to doctoral students. the program.

Class syllabus:
Laser analytical techniques in spectroscopy: laser absorption spectroscopy, frequency ridge spectroscopy, Raman spectroscopy, photoacoustic spectroscopy, ultrafast laser spectroscopy, laser-induced spectroscopy, LIDAR, laser-induced fluorescence, MALDI. Laser applications in chemistry. Laser applications in environmental chemistry and materials science.

Recommended literature:
O. Svelto, Principles of Lasers, 4th edition, Springer, New York, 1998.
J. M. Hollas, Modern Spectroscopy, 4th Edition, Wiley, Chichester, 2004
H. Abramczyk, Introduction to Laser Spectroscopy. Elsevier. 2005.
D. L. Andrews, Applied Laser Spectroscopy. VCH-Wiley, Weinheim. 1992.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 0

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

Lecturers: Matej Veis, PhD., doc. RNDr. Mário Janda, PhD.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-233/00	Laser Technique

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

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

Learning outcomes:
The student will master the basic principles of design of optical quantum generators and amplifiers.

Class syllabus:
Optical resonators, mirrors and dispersive elements of optical resonators. Methods of laser radiation forming. Specificity of different types of lasers (gas, solid state, diode). Methods to shorten laser pulses. Utilisation of lasers in science, industry and medicine.

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

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 17

A	B	C	D	E	FX
94,12	0,0	0,0	0,0	5,88	0,0

Lecturers: RNDr. Pavel Vojtek, CSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-239/15	Laser-generated 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:

Antirequisites: FMFI.KEF/2-FOL-239/09

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): 50/50

Learning outcomes:
The student will gain knowledge in the field of laser-generated plasma, the accuracy and possibilities of using laser-generated spark and its spectroscopy.

Class syllabus:
Laser-generated plasma, history, laser-generated spark spectrophy (LIBS), laser ablation of solids using femto, pico and nano-second lasers, qualitative elemental analysis using LIBS, atomic constants database, trace element detection using LIBS, detection limits (LOD), options sensitivity increases - two-pulse LIBS, LIBS in vacuum UV range, laser ablation in combination with low pressure electric discharge (LA ICP OES), quantitative LIBS - method of calibration-free CF LIBS, calculation of electron concentration and temperature, self-absorption correction, Saha Boltzmann L diagram, (CCD, CMOS, iCCD, EM CCD), possibilities of resolution and detection of stable isotopes by LIBS, molecular emission spectroscopy by LIBS. LIBS applications (biomedical, pharmaceutical, chemical, geological ...).

Recommended literature:
Optics and lasers : Including fibers and optical waveguides / Matt Young. Berlin : Springer, 2000
Principles of laser plasmas / Edited by George Bekefi. New York : John Wiley, 1976
Laser spectroscopy : Basic concepts and instrumentation / Wolfgang Demtröder. Berlin : Springer, 1981
Selection of current articles from the area.

Languages necessary to complete the course:
english

Notes:

Past grade distribution
Total number of evaluated students: 6

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

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-202/13	Light Scattering by Small Particles

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

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

Learning outcomes:
The student will gain basic knowledge of the theory of electromagnetic interaction of radiation with particles of any size, shape and composition as they commonly occur in real conditions, the optical response of such a system with emphasis on applications in astronomy, meteorology, but also laboratory diagnostics.

Class syllabus:
Basic principles of light scattering by small particles. Solution of wave equation for spherical particles - Mie's theory. Decomposition into spherical accordions. Scattering matrix, coherence, phase and extinction matrix. Polydisperse system of dispersing particles. Light scattering by non-spherical particles. Basic principles of the T-matrix method. Approximation by discrete dipoles. Calculation methods (DDSCAT), examples. Build your own model. Some applications in astrophysics and atmospheric optics

Recommended literature:
General physics: 3: optics / Anton Štrba. Bratislava: Alfa, 1979
Theory of the electromagnetic field / Milan Noga. Bratislava: Comenius University, 2005
Electromagnetism / Andrej Tirpák. Bratislava: Polygrafia SAV, 1999

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 6

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

Lecturers: Mgr. Miroslav Kocifaj, DrSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-109/22	Nonlinear 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: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework, calculation of examples
Exam: exam
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 knowledge of the basics of the theory of nonlinear optical phenomena. He will know the possibilities of using these phenomena in determining opt. properties of substances and in laser physics.

Class syllabus:
Time and frequency representation of nonlinear polarization of optical materials. Quantum theory of nonlinear susceptibility. Propagation of electromagnetic waves in a nonlinear environment. Resonant and non-resonant nonlinear phenomena. Generation of higher harmonic frequencies. Multifrequency nonlinear mixing. Second-order nonlinear phenomena. Processes based on nonlinear induced refractive index change. Processes based on stimulated light scattering. Influence of material dispersion on nonlinear processes. Generation of optical solitons. Nonlinear processes of ultrafast and high power laser pulses. Nonlinear optics in optical fibers and photonic materials.

Recommended literature:
Y. R. Shen, The principles of nonlinear optics, J. Willey and Sons, N. Y. 1984
R. Boyd, Nonlinear optics, Ac. Press, N. Y. 2020

Languages necessary to complete the course:
English

Notes:

Past grade distribution Total number of evaluated students: 21					
A	B	C	D	E	FX
66,67	23,81	9,52	0,0	0,0	0,0
Lecturers: doc. RNDr. Tomáš Roch, Dr. techn., Mgr. Ignác Bugár, PhD.					
Last change: 18.02.2022					
Approved by: prof. RNDr. Pavel Veis, CSc.					

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. RNDr. Pavel Veis, CSc.

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-240/22	Optical fibers, micro- and nanostructured waveguides

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

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: individual work,
Final assessment: Exam: oral,
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 master the principles of conduction and transformation of optical radiation using classical optical fibers and their advanced forms such as microstructural fibers, anti-resonance fibers or waveguides based on photonic crystals.

Class syllabus:
Basic characteristics of optical fibers, mode structure, losses, dispersion. Modifications of the cross section of optical fibers in order to improve dispersion and polarization properties. Multimode, multicore and polarization preserving fibers for telecommunication purposes. Extending the conveniences of optical fibers using their photonic (microstructural) forms. Fiber lasers and optical fibers with a large area of guided mode. Fundamentals of fiber nonlinear optics. Coherent broad-spectrum light sources using supercontinuum generation in microstructured fibers. Hollow core fibers based on photonic lines. Fibers made from multi-component glasses for long-wave infrared radiation. Anti-resonance fibers for high-performance and telecommunication purposes. Integrated optics and its advanced forms based on photonic crystals. Introduction to fiber sensors.

Recommended literature:
Govind Agrawal: Fiber-Optic Communication Systems (4 ed.). 2010, Wiley
Bahaa E. A. Saleh, Malvin Carl Teich: Fundamentals of Photonics 1991, John Wiley & Sons
Katsunari Okamoto: Fundamentals of Optical Waveguides, (Second Edition) 2006, Elsevier

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 0

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

Lecturers: doc. RNDr. Tomáš Roch, Dr. techn., Mgr. Ignác Bugár, PhD.

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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: 1.

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. RNDr. Pavel Veis, CSc.

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-234/00	Optics of Thin Layers

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

Learning outcomes:
Passing the course will enable the student to master the theory and methods of calculation of thin film systems.

Class syllabus:
Fresnel relations and their analysis. Thin and thick layer. Thin layer on a glass. Calculating of a thin layers system reflectivity and transmitivity. Alternating layers and a matrix method of reflectivity calculation. Utilisation of thin layers in optical and laser systems.

Recommended literature:
Vašíček A., Optika tenkých vrstev, Nakl. ČSAV, Praha 1956
Haus H. A., Waves and fields in optoelectronics, Prentice-Hall, N. Jersey 1984
Müllerová J., Spektrofotometria tenkých vrstie, SES, Liptovský Mikuláš 2004

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 14

A	B	C	D	E	FX
85,71	14,29	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Tomáš Roch, Dr. techn.

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 201

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

Lecturers: Mgr. Xenia Daniela Poslon, PhD.

Last change: 06.09.2023

Approved by: prof. RNDr. Pavel Veis, CSc.

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-FFP-215/22	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: II.

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

english

Notes:

Past grade distribution
Total number of evaluated students: 115

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

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

Last change: 18.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1911

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1797

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1454

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

Educational level: I.II., II.

Prerequisites:

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

Learning outcomes:

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

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1267

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

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

Last change: 15.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-109/22	Physical Methods of Thin Films Preparation

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

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Mid-term evaluation: homeworks, presentation
Exam: oral
It is necessary to obtain at least 90% of points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% of points to grade D and at least 50% to grade E.
Scale of assessment (preliminary/final): Exam weight in rating: 20/80

Learning outcomes:
The student will first get acquainted with the technical possibilities of achieving vacuum, its measurement and control of working gases. He will gain a comprehensive knowledge of physical methods of preparation of thin films (evaporation, sputtering, arc evaporation, pulsed laser deposition), where he will be explained in detail the physical aspects of the processes. The student will gain information about the growth of thin films, the influence of deposition parameters on the structure and properties of films. In the last part he will be introduced to the possibilities of creating functional structures in films using ion treatment and lithographic methods.

Class syllabus:
vacuum pumps, scales and flow controllers, Langmuir probe, mass spectroscopy, evaporation, DC and RF sputtering, magnetron, glow discharge, plasma parameters, high energy pulses (HiPPMS), pulsed laser deposition, laser optics, ablation mechanism, arc evaporation, cathode macroparticle filtering, thin film growth, surface energy, thermodynamic nucleation model, zonal models, texture, epitaxy, focused ion beam, nanotubes, electron lithography, optical lithography

Recommended literature:
M. Ohring: Materials Science of Thin Films – Deposition and Structure, Academic Press, 2002
D.L. Smith, Thin film deposition, principles and practice, McGraw-Hill, 1995
P. M. Martin: Handbook of Deposition Technologies for Films and Coatings, Elsevier, 2005

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 31

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

Lecturers: doc. Ing. Marián Mikula, PhD., Mgr. Branislav Grančič, PhD., Mgr. Leonid Satrapinskyy, PhD.

Last change: 20.01.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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-101/22	Physics of 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: 1.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KEF/2-FOL-101/00

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

Learning outcomes:
The student will gain knowledge of the theory of amplification and the generation of coherent optical radiation.

Class syllabus:
- Photons, interaction of photons with atoms, Einstein coefficients, spectral line shape, dispersion and propagation constant, amplification coefficient, three- and four-level systems, saturation, optical quantum amplifier, semiclassical interaction theory, Fabry-Perot resonator laser, generation frequency spectrum, three- and four-level systems in lasers.
- Laser power, optimal feedback, multi-frequency generation, mode synchronization, gigantic pulse generation, modes and their selection, Gaussian beam, its transformation,
resonators with spherical mirrors.
- The most famous lasers and special laser systems. Examples.
- Nonlinear optical phenomena.

Recommended literature:
Laserphysik / H. P. Brändli, R. Dändliker, J. Hatz. Bern : Hallwag, 1970
Laser spectroscopy : Basic concepts and instrumentation / Wolfgang Demtröder. Berlin : Springer, 1981
Svetlo : Vlny, lúče, fotóny / 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: 9

A	B	C	D	E	FX
55,56	11,11	22,22	11,11	0,0	0,0

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

Last change: 17.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

STATE EXAM DESCRIPTION

Academic year: 2025/2026	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KEF/2-FOL-955/15	**Course title:** Physics of Lasers and Optical Spectroscopy
Number of credits: 6	
Educational level: II.	
Course requirements: Exam: oral Scale of assessment (preliminary/final): 0/100	
Learning outcomes: The result of successful completion of the state subject will be the completion of the state final exam.	
Class syllabus: The state final exam of the study program Optics, Lasers and Optical Spectroscopy consists of two areas: 1) issues in the field of laser physics: construction, characteristics and principle of operation of lasers, laser technology and laser applications 2) range of questions from optical spectroscopy: structure of atoms and molecules, principles of spectroscopy, laser spectroscopy and use of spectroscopic methods	
State exam syllabus:	
Recommended literature: Laser spectroscopy: Basic concepts and instrumentation / Wolfgang Demtröder. Berlin: Springer, 1981 Light: Waves, rays, photons / Anton Štrba, Vladimír Mesároš, Dagmar Senderáková. Nitra: Enigma, 2011	
Languages necessary to complete the course: English	
Last change: 18.02.2022	
Approved by: prof. RNDr. Pavel Veis, CSc.	

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: 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): 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. RNDr. Pavel Veis, CSc.

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-111/15	Principles and Methods of Applied 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: 3

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KEF/2-FOL-111/00

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:
After completing the course, the student will master the basic principles of advanced methods of applied optics and get acquainted with new trends in their development.

Class syllabus:
Digitization and processing of optical signal. Computer-aided methods for increasing the sensitivity of optical measurements. Homodyne, heterodyne and synchronous optical signal detection. Phase visualization of the optical field. Light diffraction in sensing deformation, dimensional distribution of particles and periodic structures. Correlation analysis of speckle structures and temporal / spatial course of optical signals. Moiré effect applications. Synthesized aperture in interferometry and optical transmission function. Optical localization of points on the surface of bodies, 3-D visualization. Micro and nanometrology using optical principles. Detection and visualization of the velocity field in liquids and gases.

Recommended literature:
Optical signal processing: Fundamentals / Pankaj K. Das. Berlin: Springer, 1991
Optics and lasers: Including fibers and optical waveguides / Matt Young. Berlin: Springer, 2000
Technical optics / Gottfried Schröder; translated from the German original by Zdeněk Berger. Prague: Státní nakladatelství technické literatury, 1981

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 20

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

Lecturers: RNDr. Milan Držík, CSc.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 738

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 435

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 212

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 153

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

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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. RNDr. Pavel Veis, CSc.

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-154/22	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: 2.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework
Exam: presentation
Scale of assessment (preliminary/final): 50/50

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 laser physics, optics and optical spectroscopy. The student will develop an experimental or theoretical method related to laser physics, optics or optical spectroscopy. The obtained results will be processed in written form in the range of about 10-15 pages.

Recommended literature:
Selection of current articles from the area.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 5

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

Lecturers: prof. RNDr. Pavel Veis, CSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 113

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 86

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 3., 9.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 32

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 4., 10.

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

Prerequisites:

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

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

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

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

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 25

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

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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: 2.

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. RNDr. Pavel Veis, CSc.

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-211/22	Special Practical in Optics and Laser 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: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KEF/2-FOL-211/00

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

Learning outcomes:
The student will gain knowledge of experimental methods of modern optics and laser physics.

Class syllabus:
Study of coherence of optical quantum generators. Optical holography. Interference methods. Study of rigid laser. Laser picosecond spectroscopy. Transmission properties of optical fibers. Second harmonic generation and parametric generation.

Recommended literature:
Optics and lasers: Including fibers and optical waveguides / Matt Young. Berlin: Springer, 2000
Laser holography / Tung H. Jeong, Albert B. Dick. Bratislava: CODEA, 1991
Laserphysics / H. P. Brändli, R. Dändliker, J. Hatz. Bern: Hallwag, 1970

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

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

Lecturers: Mgr. Michaela Horňáčková, PhD., RNDr. Ján Greguš, PhD., RNDr. Pavel Vojtek, CSc., RNDr. Zuzana Zábudlá, doc. Mgr. Peter Čermák, PhD.

Last change: 18.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 1., 7.

Educational level: I.II., II.

Prerequisites:

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

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

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

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 160

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

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

Last change: 16.06.2022
Approved by: prof. RNDr. Pavel Veis, CSc.

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

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

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

Number of credits: 2

Recommended semester: 2., 8.

Educational level: I.II., II.

Prerequisites:

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

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

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

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ will provide sports equipment.

Past grade distribution
Total number of evaluated students: 109

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

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

COURSE DESCRIPTION

Academic year: 2025/2026

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTF/2-FOL-235/00	Theory of 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: 3.

Educational level: II.

Prerequisites:

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

Learning outcomes:
Ability to calculate the basic physical quantities characterizing the properties of the electromagnetic field in the near and far field of the charge system, radiating in the classical approximation

Class syllabus:
Retarded potentials, Lienard-Wiechert potentials, radiation of the linear antenna, multipole expansion of retarded potentials in the quasistatic and wave region, radiation friction, consistency of classical electrodynamics, the natural width of spectral lines, scattering of electromagnetic waves.

Recommended literature:
L.D.Landau, E.M.Lifschitz: The Classical Theory of Fields, Volume 2
J.D.Jackson: Classical electrodynamics, 3.ed.,1998
V.V.Batygin, I.N.Toptygin: Problems in Electrodynamics, 2.ed., 1978.

Languages necessary to complete the course:
Slovak or English

Notes:

Past grade distribution
Total number of evaluated students: 3

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

Lecturers: RNDr. Eduard Masár, PhD.

Last change: 23.02.2022

Approved by: prof. RNDr. Pavel Veis, CSc.

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. RNDr. Pavel Veis, CSc.