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COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-014/22	Air and Water Protection and Pollution Control, and Waste Disposal

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

Number of credits: 10

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course takes place in the form of an oral exam, the successful completion of which reflects the sufficient orientation of the student in the issue. The course will be classified provided that the PhD 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.

Learning outcomes:
By completing the course, the student acquires a comprehensive knowledge on environmental protection and technologies for air and water pollution control, waste disposal and existing environmental legislation.

Class syllabus:
Environmental pollution. Global environmental issues. Pollutants – their categorization, properties, sources and effects on humans. Prevention of pollutants' formation and their removal. Air pollution control for gaseous pollutants - adsorption, absorption, biofiltration, condensation, adsorption, thermal and catalytic oxidation and reduction, electric plasma and other alternative methods, etc. Air pollution control for particulate matter – cyclones, scrubbers, fabric filters, electrostatic precipitators, etc. Water pollution control – mechanical, physical, chemical and biological methods. Ozonation and advanced oxidation technologies. Waste – categorization and properties. Waste management. Reduction, recycling, composting, incineration, landfilling. Collection, separation, removal and disposal of waste. Environmental law – system, principles and subjects of law. Prevention, responsibility and care for the environment. Legislation on land protection and land care, air, water and waste.

Recommended literature:
K. Wark: Air pollution - Its origin and control, Addison-Wesley (1998);
D. L. Russell: Practical Wastewater Treatment, Wiley (2006);
J. Pichtel: Waste management practices, Taylor & Francis (2005);
legislation of Slovak Republic and European Union on environmental protection.

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

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers: doc. RNDr. Karol Hensel, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-007/22	Air, Water and Soil Pollution and the Spread of Pollutants in the Environment

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of an oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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.

Learning outcomes:
The student will gain an overview about pollution of individual compartments of the environment, as well as about atmospheric, water and soil pollutants and their effects. The student will understand local, regional, and global environmental pollution, the principles of the spread of individual pollutants and their mutual interactions.

Class syllabus:
Components of the environment and their pollution.
Air: Mean residence time of gases and particles in the air. Exchange between the main atmospheric reservoirs. Atmospheric evolution. Local, regional and global air pollution. Chemical and photochemical processes in the atmosphere. Ground-level ozone, photochemical smog. Stratospheric chemistry. Ozone depletion. Chemistry of stratospheric polar clouds, formation of ozone holes. Nitrogen oxides and the nitrogen cycle. Sulphur oxides and the sulphur cycle. Volatile organic compounds. Atmospheric aerosol. Airborne dust. PM10 and PM2.5 dust particles. Carbon oxides and the carbon cycle. Greenhouse effect. Spread and dispersion of pollutants in the air. Air pollution monitoring.
Water and soil: Vital and toxic elements. Heavy metals (lead, mercury, cadmium). Other inorganic toxic substances (chromium, arsenic, fluorine, chlorine, beryllium, radioactive elements). Toxic organic substances (pesticides, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, dioxins, furans). Spread of pollutants in water and soil. Bioaccumulation and biomagnification. Water pollution monitoring.

Recommended literature:

J. Tölgyessy, V. Betina and V. Frank: Chémia, biológia a toxikológia vody a ovzdušia, Veda, 1989;
The World Bank group: Pollution Prevention and Abatement Handbook, 1999;
J. H. Seinfeld and S. N. Pandis: Atmospheric Chemistry and Physics, John Wiley and Sons, 2006;
E. Boeker and R. van Grondelle: Environmental Physics, John Wiley and Sons, 2011

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

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers: prof. RNDr. Zdenko Machala, DrSc., Mgr. Richard Cimerman, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-807/22	Assistance in Conference Organizing Committee

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
Assistance in organizing a conference.

Class syllabus:
Active participation in the organization of a conference.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-019/22	Atmospheric Chemistry

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

Number of credits: 10

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (individual work) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
To acquaint students with the latest knowledge of the theory of chemical processes in the atmosphere in relation to meteorological processes.

Class syllabus:
Chemical kinetics, photochemistry and radical chemistry in the atmosphere. Homogeneous and heterogeneous chemical reactions and chemical reactions in the aqueous phase. Transformation of atmospheric pollutants in the air, secondary pollutants. Chemistry of clouds and precipitation. Differences between day and night chemistry. Oxidation capacity of the atmosphere and its expected trend. Chemistry of urban atmosphere. Atmospheric boundary layer chemistry. Chemistry of the free troposphere. Ground-level ozone, photochemical smog. Stratospheric chemistry. Ozone depletion. Chemistry of polar stratospheric clouds, formation of ozone holes. Mathematical modeling of atmospheric chemistry at the local, regional and global levels.

Recommended literature:
The latest literature, sources from scientific journals and information published on the Internet as recommended by the lecturer at the beginning of the semester.
Older literature:
Warneck, P., 1988: Chemistry of the natural atmosphere. Academic Press, San Diego, 758 pp;
Závodský, D. – Ďurec, F. – Medveď, M., 2001: Atmospheric chemistry and air pollution modelling. UMB Banská Bystrica, 128 pp;
World Meteorological Organisation: International assessments of ozone depletion. WMO Ženeva, 1995 a WMO/UNEP Nairobi 1999;

Fegner, J. – Hertel, O. – Palmgren, F. (editors), 1999: Urban air pollution – European aspects. Kluver Academic Publishers, Dordrecht, 475 pp

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

Notes:

Past grade distribution
Total number of evaluated students: 2

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Martin Gera, PhD., RNDr. Martin Kremler, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-012/22	Climate Changes, their Causes and Impacts

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
Seminary presentation during the semester, if successful then exam. The course will be classified provided that the PhD 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.

Learning outcomes:
The newest information on the Climatic Changes and Climate Change theory.

Class syllabus:
The theory of climatic changes from the Pre-Cambrium to Pleistocene. Changes in climate during the Holocene. Methods of paleoclimatic reconstruction. Changes in climate during the last millennium and more detail since 1850. Physical and other causes of historical climatic changes and the current climate change. Anthropogenic interference with the Earth's Climate System. Modelling of the Earth's Climate System. Climate change scenarios for the 21st century. Possible impacts of climatic changes - historical analysis and modeling of possible future impacts.
Changes in regional climatic characteristics and climatic normals due to the changes of Earth's Climate System parameters.
Preparing of seminary study and lecture.
This scheme is covering approximately the whole current extent of this theme. It can be changed according to decision of lecturer depending on the dissertation thesis of students.

Recommended literature:
Papers from scientific journals and proceedings.
Papers and reports published by the IPCC (www.ipcc.ch).

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

Notes:
Any number of students.

Past grade distribution Total number of evaluated students: 3	
ABS	NEABS
100,0	0,0
Lecturers: prof. RNDr. Milan Lapin, CSc., RNDr. Marián Melo, PhD.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-704/22	Co-Investigator of the Scientific Project

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
Active student participation.

Learning outcomes:
The student will acquire practical experience with the design, preparation and conducting of a scientific project.

Class syllabus:
Participation in the preparation of a scientific project. Participation in project research tasks. Assistance in preparing the annual/final project report.

Recommended literature:

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 2

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-001/22	Combustion Processes in Power Generation and Transportation

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of an oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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.

Learning outcomes:
The student will gain an overview of the possibilities of power generation using fossil and non-fossil fuels using combustion, autooxidation and thermal degradation processes, and the principles and diagnostics of combustion processes. A part of the lecture is an overview and description of methods of capture, separation and sequestration of greenhouse gases.

Class syllabus:
Non-renewable and renewable energy sources, primary and secondary energy sources, Energy fuels and their properties (coal, liquid fuels, gaseous fuels, less valuable and substitute fuels). Current state and forecasts of energy production and consumption, classification of energy sources, energy balance of the Earth.
Basic properties and description of the combustion process in energy systems focused on the production of electricity, heat and transport. Basic processes of solid fuel combustion, layer combustion, fluidized bed combustion, flue gas recirculation, catalytic combustion. Internal and external combustion engines, types of engines (Otto, Diesel and other less used engines).
Fuel technologies, fluidized bed combustion, coal gasification, coal liquefaction, alcohol as fuel, electrochemical fuel cells and generators. Combined cycle. Combustion turbines.
Greenhouse gases and carbon footprint, possibilities of reducing greenhouse gas emissions.

Recommended literature:
Stanislav Malík, Náhradné palivá v parných kotloch, Alfa SNTL 1988;
Š. Marko, I. Daruľa, A.Smola, P.Šimunek, Energetické zdroje a premeny, Alfa 1988;
Pavel Augusta a kol, Velká kniha o energii, LA Consulting Agency, Praha 2001, ISBN 80-238-6578-1;

Stephen Turns (2011). An Introduction to Combustion: Concepts and Applications;
B. Smit, J. A. Reimer, C.M. Oldenburg, I.C. Bourg: Introduction to Carbon Capture and Sequestration (The Berkeley Lectures On Energy Book 1), Imperial College Press ISBN: 978-1-78326-327-1

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

Notes:

Past grade distribution
Total number of evaluated students: 2

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Zdenko Machala, DrSc., Mgr. Richard Cimerman, PhD., doc. RNDr. Marcela Morvová, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-501/22	Completion of PhD Research Project Stage (1)

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will actively participate in conducting the tasks of the project, he/she will fulfil the assigned tasks and successfully complete the entrusted stage of research work. Completion of the stage will be confirmed by preparing a written scientific report of the results obtained.

Learning outcomes:
The PhD student will develop the ability of independent and teamwork in conducting specific scientific-research problems related to the research project, e.g. solving the assigned tasks of the project, planning and implementation of experiments, written processing of results in the form of a report, their publication in journals, and presentation at scientific conferences or seminars.

Class syllabus:
Active participation in conducting research project tasks. Independent scientific activity and fulfilment of assigned tasks. Successful completion of a selected stage of research work. Elaboration of a written scientific report from the obtained results.

Recommended literature:

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

Notes:

Past grade distribution
Total number of evaluated students: 4

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-502/22	Completion of PhD Research Project Stage (2)

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

Number of credits: 10

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will actively participate in conducting the tasks of the project, he/she will fulfil the assigned tasks and successfully complete the entrusted stage of research work. Completion of the stage will be confirmed by preparing a written scientific report of the results obtained.

Learning outcomes:
The PhD student will develop the ability of independent and teamwork in solving specific scientific-research problems related to the research project, e.g. conducting the assigned tasks of the project, planning and implementation of experiments, written processing of results in the form of a report, their publication in journals, and presentation at scientific conferences or seminars.

Class syllabus:
Active participation in conducting research project tasks. Independent scientific activity and fulfilment of assigned tasks. Successful completion of a selected stage of research work. Elaboration of a written scientific report from the obtained results.

Recommended literature:

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

Notes:

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-503/22	Completion of PhD Research Project Stage (3)

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

Number of credits: 10

Recommended semester: 6.

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will actively participate in conducting the tasks of the project, he/she will fulfil the assigned tasks and successfully complete the entrusted stage of research work. Completion of the stage will be confirmed by preparing a written scientific report of the results obtained.

Learning outcomes:
The PhD student will develop the ability of independent and teamwork in solving specific scientific-research problems related to the research project, e.g. conducting the assigned tasks of the project, planning and implementation of experiments, written processing of results in the form of a report, their publication in journals, and presentation at scientific conferences or seminars.

Class syllabus:
Active participation in conducting research project tasks. Independent scientific activity and fulfilment of assigned tasks. Successful completion of a selected stage of research work. Elaboration of a written scientific report from the obtained results.

Recommended literature:
Slovak/English (suggested readings in English)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/3-MXX-101/15	Course of English for PhD Studies (1)

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

Number of credits: 5

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 200

A	ABS	B	C	D	E	FX	NEABS
42,0	53,5	0,5	0,0	0,0	2,0	0,0	2,0

Lecturers: PhDr. Alena Zemanová, Mgr. Simona Tomášková, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/3-MXX-102/15	Course of English for PhD Studies (1)

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

Number of credits: 5

Recommended semester: 2.

Educational level: III.

Prerequisites: FMFI.KJP/3-MXX-101/15 - Course of English for PhD Studies (1)

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 193

A	ABS	B	C	D	E	FX	NEABS
45,6	48,7	0,0	0,0	0,0	0,0	0,0	5,7

Lecturers: PhDr. Alena Zemanová, Mgr. Simona Tomášková, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-805/22	Creation of Teaching Aids and Texts

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
Creation of a teaching aids or texts as specified.

Class syllabus:
Active participation in the creation of teaching aids and texts.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM+KJFB/3-FEM-201/22	Department 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: 5

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
Active presence of the doctoral student at minimum 60% seminars. Student's presentation.

Learning outcomes:
By actively participating at the professional department (division) seminar, the student will gain a broader overview of professional issues and learn how to present own scientific results.

Class syllabus:
Active presence at the department seminar. Students' own professional and scientific work and publication of partial results of their scientific work. Preparation of the materials for the department (division) seminar.

Recommended literature:
Selection of actual literature from relevant topics;
Ako písať vysokoškolské a kvalifikačné práce : Ako písať seminárne práce, ročníkové práce, práce študentskej vedeckej a odbornej činnosti, diplomové práce, záverečné a atestačné práce, dizertácie / Dušan Katuščák. Bratislava : Stimul, 1998.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Martin Gera, PhD., prof. RNDr. Zdenko Machala, DrSc., doc. RNDr. Ivan Sýkora, PhD.

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM+KJFB/3-FEM-202/22	Department 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: 5

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
Active presence of the doctoral student at minimum 60% seminars. Student's presentation.

Learning outcomes:
By actively participating at the professional department (division) seminar, the student will gain a broader overview of professional issues and learn how to present own scientific results.

Class syllabus:
Active presence at the department seminar. Students' own professional and scientific work and publication of partial results of their scientific work. Preparation of the materials for the department (division) seminar.

Recommended literature:
Selection of actual literature from relevant topics;
Ako písať vysokoškolské a kvalifikačné práce : Ako písať seminárne práce, ročníkové práce, práce študentskej vedeckej a odbornej činnosti, diplomové práce, záverečné a atestačné práce, dizertácie / Dušan Katuščák. Bratislava : Stimul, 1998.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers: doc. RNDr. Martin Gera, PhD., prof. RNDr. Zdenko Machala, DrSc., doc. RNDr. Ivan Sýkora, PhD.

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM+KJFB/3-FEM-203/22	Department Seminar (3)

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: 5

Recommended semester: 6.

Educational level: III.

Prerequisites:

Course requirements:
Active presence of the doctoral student at minimum 60% seminars. Student's presentation.

Learning outcomes:
By actively participating at the professional department seminar, the student will gain a broader overview of professional issues and learn how to present own scientific results.

Class syllabus:
Active presence at the department seminar. Students' own professional and scientific work and publication of partial results of their scientific work. Preparation of the materials for the department seminar.

Recommended literature:
Selection of actual literature from relevant topics;
Ako písať vysokoškolské a kvalifikačné práce : Ako písať seminárne práce, ročníkové práce, práce študentskej vedeckej a odbornej činnosti, diplomové práce, záverečné a atestačné práce, dizertácie / Dušan Katuščák. Bratislava : Stimul, 1998.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers: doc. RNDr. Martin Gera, PhD., prof. RNDr. Zdenko Machala, DrSc., doc. RNDr. Ivan Sýkora, PhD.

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM+KJFB/3-FEM-204/22	Department Seminar (4)

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: 5

Recommended semester: 8.

Educational level: III.

Prerequisites:

Course requirements:
Active presence of the doctoral student at minimum 60% seminars. Student's presentation.

Learning outcomes:
By actively participating at the professional department seminar, the student will gain a broader overview of professional issues and learn how to present own scientific results.

Class syllabus:
Active presence at the department seminar. Students' own professional and scientific work and publication of partial results of their scientific work. Preparation of the materials for the department seminar.

Recommended literature:
Selection of actual literature from relevant topics;
Ako písať vysokoškolské a kvalifikačné práce : Ako písať seminárne práce, ročníkové práce, práce študentskej vedeckej a odbornej činnosti, diplomové práce, záverečné a atestačné práce, dizertácie / Dušan Katuščák. Bratislava : Stimul, 1998.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers: doc. RNDr. Martin Gera, PhD., prof. RNDr. Zdenko Machala, DrSc., doc. RNDr. Ivan Sýkora, PhD.

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-701/22	Development of Novel Software Product Linked with PhD Thesis

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The subject will be classified based on practical verification of software functionality.

Learning outcomes:
Development of novel software linked to the dissertation and its creative application in solving dissertation tasks.

Class syllabus:
Development of software related to the dissertation (PhD thesis) and its practical verification. Gaining experience in the development of software for controlling experimental devices or for solving tasks related to the dissertation in a programming language.

Recommended literature:
Slovak/English

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-801/22	Direct Pedagogical Activity (1)

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

Number of credits: 10

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
Minimum 2 hours of pedagogical activities per week.

Learning outcomes:
The student will gain an experience with direct pedagogical activities in conducting of computational exercises or laboratory practices.

Class syllabus:
Regular weekly teaching of students. Conducting computational exercises or laboratory practices. Consultations with the lecturer. Evaluation and correction of tests and papers.
Assistance to the lecturer in arranging the exam.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 7

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-802/22	Direct Pedagogical Activity (2)

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

Number of credits: 10

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
Minimum 2 hours of pedagogical activities per week.

Learning outcomes:
The student will gain an experience with direct pedagogical activities in conducting of computational exercises or laboratory practices.

Class syllabus:
Regular weekly teaching of students. Conducting computational exercises or laboratory practices. Consultations with the lecturer. Evaluation and correction of tests and papers.
Assistance to the lecturer in arranging the exam.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAFZM/3-FEM-950/22	**Course title:** Dissertation Examination
Number of credits: 20	
Educational level: III.	
Course requirements: Examination: oral The evaluation of the subject takes place within the state examination in accordance with the Study Regulations of Faculty of Mathematics, Physics and Informatics in Bratislava and after the submission of the written work for the dissertation examination within the set deadline. The subjects of the state examination include a discussion of the written work for the dissertation examination (prepared by the doctoral student) and other subjects of the oral examination (ad hoc) approved by the dean. The assessment is standard and reflects the sufficient orientation of the student in the topics.	
Learning outcomes: The doctoral student at the dissertation exam will demonstrate his/her ability to continue the PhD studies, present a project of the dissertation, which will be assessed by the committee.	
Class syllabus: In the first part of the exam, presentation of the dissertation project, proposal of the dissertation objectives. In the second part, the student will answer to examination committee three questions from one of the following thematic areas according to the focus of his dissertation regarding the individually studied literature and the recommendation of the supervisor: - Energy sources, pollution and protection of the environment. - Radiation environmental physics. - Physical processes in the atmosphere and in the Earth's climate system. The composition of the examination committee, assignment of the reviewer and the course of the dissertation examination are governed by the current Study Regulations of Faculty of Mathematics, Physics and Informatics.	
State exam syllabus:	
Recommended literature: No specification due to the nature of the subject. The recommended literature is part of the doctoral student's individual study plan.	
Languages necessary to complete the course: Slovak, English	
Last change: 14.04.2022	
Approved by:	

STATE EXAM DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-990/22	Dissertation Thesis Defence

Number of credits: 30

Educational level: III.

Course requirements:

Examination: oral

The evaluation of the subject takes place within the state examination in accordance with the Study Regulations of Faculty of Mathematics, Physics and Informatics in Bratislava and after the submission of the dissertation thesis (as final thesis). The assessment is standard and reflects the sufficient orientation of the student in the topics.

Learning outcomes:

The aim of the course is to make use of theoretical, methodological and applied knowledge of doctoral studies in the elaboration and subsequent defense of the dissertation thesis and thus the successful completion of doctoral studies.

Class syllabus:

With the dissertation, the student demonstrates the ability and readiness for independent scientific and creative activity in the field of research or development. It should be characterized by a high degree of analysis and synthesis of knowledge, as well as a sufficient overview of the existing literature. The work must be original, created by the author in compliance with the rules of working with information sources. The thesis must not have the character of plagiarism, it must not infringe the copyrights of other authors. The author is obliged to consistently cite the information sources used, to name the specific results of research of other authors by citing the relevant source, to accurately describe the methods and working procedures used by other authors, to document the laboratory results of other authors. The citation technique is guided by the practice in the given scientific field, respecting the relevant norms and standards. The composition of the examination committee, assignment of the reviewers and the course of the dissertation examination are governed by the current Study Regulations of Faculty of Mathematics, Physics and Informatics.

State exam syllabus:

Recommended literature:

No specification due to the nature of the subject. The recommended literature is part of the doctoral student's individual study plan.

Languages necessary to complete the course:

Slovak, English

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-302/22	Domestic Journal – Current Content/Registered in WoS Database

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

Number of credits: 30

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will be able to successfully publish a manuscript in a domestic journal – current content or registered in Web of Science database. The number of credits (30) is the maximum available, that can be reduced by the supervisor after taking into account the partial share of the student in the preparation of the paper.

Learning outcomes:
The PhD student will gain practical experience with processing the results for publication, preparation and writing of the manuscript, sending it to journal and responding to reviewer's comments.

Class syllabus:
Processing of results and their preparation for publication. Manuscript preparation. Submitting a manuscript to the editor. Answering comments of reviewers. Proofs reading. Communication with the journal editor.

Recommended literature:

Languages necessary to complete the course:
Slovak/English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-304/22	Domestic Journal – Non-Current Content/Non-Registered in WoS Database

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

Number of credits: 15

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will be able to successfully publish a manuscript in a domestic journal – non-current content or non-registered in Web of Science database. The number of credits (15) is the maximum available, that can be reduced by the supervisor after taking into account the partial share of the student in the preparation of the paper.

Learning outcomes:
The PhD student will gain practical experience with processing the results for publication, preparation and writing of the manuscript, sending it to journal and responding to reviewer's comments.

Class syllabus:
Processing of results and their preparation for publication. Manuscript preparation. Submitting a manuscript to the editor. Answering comments of reviewers. Proofs reading. Communication with the journal editor.

Recommended literature:

Languages necessary to complete the course:
Slovak/English

Notes:

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-804/22	Elaboration of the Reviewer's Report on the Final Thesis

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
Elaboration of the reviewer's opinion on the thesis of a bachelor (master) student.

Class syllabus:
Critical reading of the bachelor (master) student's thesis. Assessment of the thesis from a professional and formal point of view. Pointing out the deficiencies of the thesis. Grading the thesis. Elaboration of the reviewer's report and participation in the thesis defense.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-018/22	Environmental Biophysics

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

Number of credits: 10

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
To acquaint doctoral students with the biological aspects of environmental physics.

Class syllabus:
1. Physical factors of the external environment. Interaction of a living system with environmental factors. 2. The effect of mechanical factors on the organism. Influence of gravity and weightless state. Positive and negative acceleration. Kinetosis. Harmful effects of mechanical energy: shocks and vibrations. Influence of vacuum (hypobaria) and hypoxia. Influence of overpressure (hyperbaria). Henry's law and decompression sickness. Disbarism and barotrauma. 3. Effect of acoustic factors. Sound and ultrasonic fields. Noise and acoustic bang. Hearing disorders. Biophysics of ultrasound. Ultrasound generators. Properties and biological effects of ultrasound. Application of ultrasound in therapy. Properties and biological effects of infrasound. 4. Influence of meteorological conditions. Effects of thermal energy and humidity. Heat exchange between the organism and the environment. Thermoregulatory mechanisms in the living system. Influence of heat, cold, humidity on thermoregulation. Electroclimate. Influence of positive and negative ions of spatial charge. 5. Influence of electric field. Conduction of electric current through tissues. The effect of direct current. Electrophoresis and electroosmosis. Effect of low and high frequency alternating currents. Electrical tissue irritation. Electronic stimulators and high-frequency microthermotherapy. 6. Influence of magnetic fields. Static, variable and pulsed magnetic fields. Magnetic fields homogeneous and inhomogeneous. 7. Influence of ionizing radiation. Effects of visible light. Solar dermatitis. Properties and thermal effects of IR radiation. Biochemical and biological effects of UV radiation. 8. Influence of ionizing radiation. Direct and indirect effect. Levels of the body's response to radiation and forms of damage to the body. Primary and secondary cosmic rays. Analysis of effects on living systems.

Recommended literature:
Rádionuklidová röntgenofluorescenčná analýza zložiek životného prostredia / Juraj Tölgyessy, Emil Havránek, Eva Dejmková. Bratislava : Alfa, 1983;
G.S. Campbell: An Introduction to Environmental Biophysics, Springer Verlag, New York 2010

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

Notes:

Past grade distribution
Total number of evaluated students: 2

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Melánia Babincová, DrSc.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-003/22	Experimental Methods of Radiation Environmental Physics

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of written and oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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.

Learning outcomes:
After completing the course, students will gain an overview of experimental methods applicable in environmental physics and their practical use in solving real problems.

Class syllabus:
Sampling methods. Low-background methods in environmental radioactivity. Determination of depth profiles of radionuclides. In-situ gamma spectrometry. Mass spectrometry. Methods of detection of radon isotopes - soil, water, outdoor atmosphere and living spaces. Integral and continuous methods of radionuclides monitoring. Methods of determining the isotopes of uranium, thorium, radium and lead.

Recommended literature:
Mass spectrometry : Principles and applications / Edmond de Hoffmann, Vincent Stroobant. Chichester: John Wiley, 2007;
Radioactive aerosols / Constantin Papastefanou. Amsterdam: Elsevier, 2008;
Analysis of environmental radionuclides / editor Pavel P. Povinec. Amsterdam: Elsevier, 2008;
Measurement of radon and radon daughters in air. NCRPM, 1988

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

Notes:

Past grade distribution Total number of evaluated students: 2	
ABS	NEABS
100,0	0,0
Lecturers: doc. RNDr. Monika Müllerová, PhD., doc. RNDr. Karol Holý, CSc., doc. RNDr. Ivan Sýkora, PhD.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-101/22	Individual Study of Science and Research Resources (1)

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the subject is individual by the supervisor, according to the individual study plan of the doctoral student. The evaluation reflects the sufficient orientation of the student in the subject. The conditions for successful completion of the course are in accordance with the Study Regulations of Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
Learn to work with SCOPUS and Web of Science databases. Search for publications related to the topic of the dissertation and be able to critically assess the content of these works and process their substantial results.

Class syllabus:
Literature search in SCOPUS and Web of Science databases by keywords and other options. Search for new published works related to the topic of the dissertation. Obtain important publications in electronic form from databases and directly from authors. Learn to critically assess the content of the articles read and process their essential results. Assessment of the obtained literature search by the supervisor.
The subject is important especially for understanding the basic theoretical and methodological aspects of the topic of the dissertation with emphasis on self-study. It contributes to the professional potential of the doctoral student in the next (scientific) stage of his/her studies.

Recommended literature:
Determined by the supervisor with respect to the topic. The recommended literature is part of the doctoral student's individual study plan.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution Total number of evaluated students: 5	
ABS	NEABS
100,0	0,0
Lecturers:	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-102/22	Individual Study of Science and Research Resources (2)

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

Number of credits: 10

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the subject is individual by the supervisor, according to the individual study plan of the doctoral student. The evaluation reflects the sufficient orientation of the student in the subject. The conditions for successful completion of the course are in accordance with the Study Regulations of Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
Learn to work with SCOPUS and Web of Science databases. Search for publications related to the topic of the dissertation and be able to critically assess the content of these works and process their substantial results.

Class syllabus:
Literature search in SCOPUS and Web of Science databases by keywords and other options. Search for new published works related to the topic of the dissertation. Obtain important publications in electronic form from databases and directly from authors. Learn to critically assess the content of the articles read and process their essential results. Assessment of the obtained literature search by the supervisor.
The subject is important especially for understanding the basic theoretical and methodological aspects of the topic of the dissertation with emphasis on self-study. It contributes to the professional potential of the doctoral student in the next (scientific) stage of his/her studies.

Recommended literature:
Determined by the supervisor with respect to the topic. The recommended literature is part of the doctoral student's individual study plan.

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution Total number of evaluated students: 3	
ABS	NEABS
100,0	0,0
Lecturers:	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-004/22	Interactions of Environmental Systems

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%.
Scale of assessment (preliminary/final): 20/80

Learning outcomes:
Latest knowledge in the field of environmental systems and their interactions - experimental and modeling approach.

Class syllabus:
Structure of environmental compartments. Atmosphere, biosphere, hydrosphere. Diffusion and convection between environmental systems. Equilibrium and nonequilibrium states in environmental systems. Disruption of equilibrium states, climate change. Global cycles in nature and their computer modeling. Compartmental models and diffusion models.

Recommended literature:
[1] Principles of environmental physics / John Monteith, Mike Unsworth. Burlington: Academic press, 2008;
[2] selection of current papers from the scientific field

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers: Ing. Jakub Kaizer, PhD., Mgr. Ivan Kontuľ, PhD., doc. RNDr. Ivan Sýkora, PhD.

Last change: 17.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-301/22	International Journal – Current Content/Registered in WoS database

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

Number of credits: 35

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will be able to successfully publish a manuscript in a current content international journal or registered in Web of Science database. The number of credits (35) is the maximum available, that can be reduced by the supervisor after taking into account the partial share of the student in the preparation of the paper.

Learning outcomes:
The PhD student will gain practical experience with processing the results for publication, preparation and writing of the manuscript, sending it to journal and responding to reviewer's comments.

Class syllabus:
Processing of results and their preparation for publication. Manuscript preparation. Submitting a manuscript to the editor. Answering comments of reviewers. Proofs reading. Communication with the journal editor.

Recommended literature:

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 4

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-303/22	International Journal – Non-Current Content/Non-Registered in WoS database

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

Number of credits: 20

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified under the assumption that the PhD student will be able to successfully publish a manuscript in an international journal – non-current content or non-registered in Web of Science database. The number of credits (20) is the maximum available, that can be reduced by the supervisor after taking into account the partial share of the student in the preparation of the paper.

Learning outcomes:
The doctoral student will gain practical experience with processing the results for publication, preparation and writing of the manuscript, sending it to journal and responding to reviewer's comments.

Class syllabus:
Processing of results and their preparation for publication. Manuscript preparation. Submitting a manuscript to the editor. Answering comments of reviewers. Proofs reading. Communication with the journal editor.

Recommended literature:

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-702/22	Introduction of Novel Experimental Method Linked with PhD Thesis

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The subject will be classified based on practical verification of novel experimental method functionality.

Learning outcomes:
Development of novel experimental method linked to the PhD thesis and its creative application in solving dissertation tasks.

Class syllabus:
Design and practical implementation of a new experimental methodology related to the topic of the dissertation, or with the topic used in practices at the department or the research group.

Recommended literature:

Languages necessary to complete the course:
Slovak/English

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-009/22	Isotope Technologies and Tracers in Environmental Studies

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of an oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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): 0/100

Learning outcomes:
Students will gain knowledge about the applications of isotope tracers in environmental studies.

Class syllabus:
Stable and radioactive tracers. Principles of isotope fractionation. Isotope fractionation in the biosphere and hydrosphere. Preparation and analytical methods.
Applications of radioactive isotopes in hydrology and in atmospheric studies. Study of the carbon cycle using isotopes. The role of isotopes in the observation of global climate change. Use of isotopes for testing of atmospheric models.

Recommended literature:
Analysis of environmental radionuclides / editor Pavel P. Povinec. Amsterdam: Elsevier, 2008;
K. Froelich at al.: Environmental radionuclides: tracers and timers of terrestrial processes. Elsevier, 2010;
W. G. Mook at al.: Environmental isotopes in the hydrological cycle. UNESCO/IAEA, 2000

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

Notes:

Past grade distribution Total number of evaluated students: 0	
ABS	NEABS
0,0	0,0
Lecturers: doc. RNDr. Monika Müllerová, PhD., RNDr. Martin Bulko, PhD., Ing. Jakub Kaizer, PhD., doc. RNDr. Karol Holý, CSc.	
Last change: 22.06.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-011/22	Modeling in Environmental Physics

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test, homeworks) and final evaluation (written and oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. 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): 30/70

Learning outcomes:
Doctoral students will be familiarized with the basic modeling approaches used in the field of simulation of environmental processes.

Class syllabus:
Transport phenomena in the atmosphere. Tracers of transport phenomena. Box model of the bound system Atmosphere - Earth's surface. Global environmental models.

Recommended literature:
Interstellar-Terrestrial relations: Variable cosmic environments, the dynamic Heliosphere, and their imprints on terrestrial archives and climate / K. Scherer [et al.]. [S.l.]: Kluwer Academic Publishers, 2006;
Principles of environmental physics / John Monteith, Mike Unsworth. Burlington: Academic press, 2008

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

Notes:

Past grade distribution Total number of evaluated students: 1	
ABS	NEABS
100,0	0,0
Lecturers: prof. RNDr. Jozef Masarik, DrSc., doc. RNDr. Radoslav Böhm, PhD.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-017/22	Nanotechnology in Environmental Physics

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

Number of credits: 10

Recommended semester: 4.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
Introducing students to the environmental aspects of nanomaterials and nanotechnology research.

Class syllabus:
Pollution of the environment by nanoparticles is a serious current problem, especially in terms of the biotoxicity of these particles. At present, a huge number of different nanomaterials are produced in the form of nanoparticles, nanotubes, nanowires or substrates having a nanostructure. It is assumed that human exposure already occurs in their production technologies. Rapidly evolving nanotechnologies thus introduce a new risk factor into the environment. The lecture will be devoted to basic physicochemical properties, characterization and influence of nanoparticles and nanomaterials on the environment

Recommended literature:
Magnetic nanoparticles / edited by Sergey P. Gubin. Weinheim : Wiley-VCH, 2009;
Living in the Environment : An Introduction to Environmental Science / G. Tyler Miller, Jr.. Belmont : Wadsworth, 1992;
G. Scrinis (2007). "Nanotechnology and the Environment: The Nano-Atomic reconstruction of Nature". Chain Reaction 97: 23–26;
Vuk Uskokovic (2007). "Nanotechnologies: What we do not know". Technology in Society 29: 43–61

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

Notes:

Past grade distribution Total number of evaluated students: 0	
ABS	NEABS
0,0	0,0
Lecturers: prof. RNDr. Peter Babinec, CSc.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJFB/3-FEM-008/22	Nuclear Energy Sources, Environmental Impact and Radiation Protection

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. 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:
Doctoral students will be familiarized with different types of nuclear energy sources and their impact on the environment.

Class syllabus:
Comprehensive overview of research, development and implementation of nuclear energy sources. Economic and environmental aspects of nuclear energy sources. Monitoring their impact on the environment and environmental processes. Optimization of the "utility/environmental impact" ratio of individual energy sources. Environmental protection. Calculation of effective doses. New nuclear energy sources.

Recommended literature:
Principles of environmental physics / John Monteith, Mike Unsworth. Burlington : Academic press, 2008;
Analysis of environmental radionuclides / editor Pavel P. Povinec. Amsterdam : Elsevier, 2008

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

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers: Mgr. Ivan Kontuľ, PhD., doc. RNDr. Miroslav Ješkovský, PhD., prof. RNDr. Pavel Povinec, DrSc., doc. RNDr. Monika Müllerová, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-005/22	Objects of the Synoptic Analysis and Forecast of Selected Characteristics of the Atmosphere

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (individual work) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
By completing the course, the student acquires a comprehensive knowledge to synoptic analysis linked to dynamic meteorology.

Class syllabus:
The analysis of the pressure field and atmospheric fronts. Peculiarities of the synoptic pattern's analysis, prediction of their formation, development and displacement. Compilation of a synoptic situation forecast. The forecast of the selected meteorological elements. Conceptual models.

Recommended literature:
Gary Lackmann (2012): Midlatitude Synoptic Meteorology: Dynamics, Analysis, and Forecasting, American Meteorological Society, 349pp., ISBN 978-1-878220-10-3;
Howard B. Bluestein (1992): Synoptic-dynamic meteorology in midlatitudes : Volume 1. : Principles of kinematics and dynamics, New York : Oxford University Press;
Howard B. Bluestein (1993): Synoptic-dynamic meteorology in midlatitudes : Volume 2. : Observations and theory of weather systems, New York : Oxford University Press

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

Notes:

Past grade distribution Total number of evaluated students: 2	
ABS	NEABS
100,0	0,0
Lecturers: doc. RNDr. Martin Gera, PhD.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-703/22	Obtaining a University Grant

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

Number of credits: 15

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified if the PhD student receives funding support for his/her university grant.

Learning outcomes:
The PhD student will gain practical experience with the preparation of a scientific project / grant, its solution, and writing of a final report.

Class syllabus:
Preparation of a scientific project/grant of Comenius University. Composition of the scientific program of the project, determination of project objectives, work progress, and project budget. Project solution. Preparation of the final report of the project.

Recommended literature:

Languages necessary to complete the course:
Slovak/English

Notes:

Past grade distribution
Total number of evaluated students: 4

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-016/22	Physics of the Atmospheric Boundary Layer

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

Number of credits: 10

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of an oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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.

Learning outcomes:
Acquiring the latest knowledge from the theory of meteorological processes in the atmosphere up to 1-3 km above the Earth's surface.

Class syllabus:
Turbulent state of the atmosphere, the vertical profiles of some meteorological elements in the boundary and surface atmospheric layers, model computation of the turbulent mass and energy fluxes, equations for mean variables in a turbulent flow, stability in the atmosphere.
The choice from given themes will be made by supervisor in compliance with thesis.

Recommended literature:
Journal „Boundary Layer Meteorology“;
Contributions in the foreign special and scientific journals;
Gera M., Tomlain, J., Damborská I.: Fyzika hraničnej vrstvy atmosféry. Bratislava: Knižničné a edičné centrum FMFI UK, 2011, 2. rozšírené vydanie, 176 s. ISBN 978-80-89186-80-8;
Roland B. Stull: An Introduction to Boundary Layer Meteorology. Kluwer Academic Publishers. Dordrecht, 2003 reprinted, 670 p. ISBN-13: 978-90-277-2769-5

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

Notes:

Past grade distribution Total number of evaluated students: 2	
ABS	NEABS
100,0	0,0
Lecturers: doc. RNDr. Martin Gera, PhD., RNDr. Ingrid Damborská, CSc.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-006/22	Physics of the Earth Climate System

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course takes place in the form of an oral exam, the successful completion of which reflects the sufficient orientation of the student in the issue. The course will be classified provided that the PhD 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.

Learning outcomes:
The newest information on the Earth's Climate System theory.

Class syllabus:
Earth's Climate System: Atmosphere, Hydrosphere, Cryosphere, Lithosphere, Biosphere and Noosphere (humans), temporal and areal distribution of mentioned subsystems. Climate forming factors on the Earth: Astronomic, Circulation, Terrestrial and Anthropogene. Physical processes existing in the Earth's Climate System: Radiation balance, Energetic (heat) balance, etc. General circulation of the atmosphere and oceans. Interaction between the Earth's Climate System subsystems, mainly between the atmosphere and hydrosphere (oceans, seas, lakes, water in the lithosphere, etc.) and between the atmosphere and cryosphere (polar ice sheets, sea ice, permafrost, snow cover…). The role of the atmospheric chemistry in the physical processes forming Earth's Climate System. Changes in regional climatic characteristics and climatic normals due to the changes in Earth's Climate System parameters.
This scheme is covering approximately the whole current extent of this theme. It can be changed according to decision of lecturer depending on the dissertation thesis of students.

Recommended literature:
Papers from scientific journals and proceedings;
Peixoto, J., P., Oort, A., H (1992): Physics of Climate. American Institute of Physics, Springer, New York, 520 pp;
Journal of Climatology. American Meteorological Society, USA

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

Notes:
Any number of students.

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Milan Lapin, CSc., RNDr. Marián Melo, PhD.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-402/22	Presentation at Domestic Conference

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

Number of credits: 15

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified if the PhD student will personally present the results of their work in the form of an oral presentation or a poster at a domestic conference in Slovak language. The conference is considered domestic if the official language is Slovak or Czech.

Learning outcomes:
The PhD student will gain experience in preparing a presentation and presenting the results of his/her scientific work to a foreign scientific audience.

Class syllabus:
Processing of experimental results. Preparation of the contribution (abstract) in the conference proceedings and of the presentation. Presentation at international conference. Answering questions from the audience.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:

Past grade distribution
Total number of evaluated students: 6

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-401/22	Presentation at International Conference

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

Number of credits: 20

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
The course will be classified if the PhD student will personally present the results of their work in the form of an oral presentation or a poster at an international conference in English. The conference is not considered international if the official language is Slovak or Czech (or other local language).

Learning outcomes:
The PhD student will gain experience in preparing a presentation and presenting the results of his/her scientific work to a foreign scientific audience.

Class syllabus:
Processing of experimental results. Preparation of the contribution (abstract) in the conference proceedings and of the presentation. Presentation at international conference. Answering questions from the audience.

Recommended literature:

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 6

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-111/22	Professional Oral Communication in English

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

Number of credits: 5

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:
Regular and active presence at the seminars, student's professional presentations in various formats. The course will be classified provided that the PhD 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.

Learning outcomes:
The aim of the course is to help the student improve his/her communication and presentation skills and stimulate discussion in a simulated scientific conference/symposium setting.

Class syllabus:
The students will be trained to deliver various formats of professional communication tools: Elevator talk (1 min). Brief poster talk (3-5 min overview of the student's research topic and key achievements), flash (3 min) and full (15-45 min) oral presentation. Technique and delivery of a good (scientific) presentation. Asking questions and adding comments, addressing peers' questions and comments. The students' topics for presentation: their current research activities or other related topics to the student's field of study. By the end of the course the student will be able to present and discuss their topic effectively in English with using a variety of tools and tips.

Recommended literature:
Armer, T.: Cambridge English for Scientists

Languages necessary to complete the course:
English

Notes:
Knowledge of English minimum at B1 level.

Past grade distribution
Total number of evaluated students: 13

ABS	NEABS
100,0	0,0

Lecturers: prof. RNDr. Zdenko Machala, DrSc.
Last change: 14.04.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-015/22	Remote Sensing of the Earth

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

Number of credits: 10

Recommended semester: 3.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of a continuous (individual work, test) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.

Learning outcomes:
Students will get knowledge about the usage of satellite for the remote sensing of Earth.

Class syllabus:
Satellite systems, active and passive sensors. Propagation condition of electromagnetic radiation in atmosphere. Satellite information for Environmental Physics; for resources search; for monitoring and protection of atmosphere, biosphere and hydrosphere; climate change research (forest, glacier, sea-ice, etc.). Lightning detection by satellites.

Recommended literature:
Recent list of journals and articles available upon request;
Older literature:
Carlsson, C.G.: An Introduction to Remote Sensing in Meteorology. SHMI, Sweden, Norrkoping 1997, 315 pp;
Reinhart, R.E.: Radar for Meteorologists. 2nd ed., North Dakota, USA, 1992, 334 pp;
Doviak, R.J., Zrnic, D.S.: Doppler Radar and Weather Observations, Academic Press, London, 1992, 562 pp;
Rao, P.K. at all.: Weather Satellites – Systems, Data and Environmental Applications, 2nd ed. AMS USA, Boston, 1994, 503 pp;
Feranec, J. a kol: Slovensko očami satelitov, Veda, Bratislava, 2010, 263s;
Feranec, J. a kol: Meniace sa Slovensko očami satelitov +DVD, Veda, Bratislava,2012, 74 s.

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

Notes:	
Past grade distribution Total number of evaluated students: 1	
ABS	NEABS
100,0	0,0
Lecturers: prof. RNDr. Milan Lapin, CSc., Mgr. Marián Jurášek	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM+KEF/3-FEM-002/22	Renewable Energy Sources

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

Number of credits: 10

Recommended semester: 1.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the course will be in the form of an oral exam, its successful completion reflects the sufficient orientation of the student in the covered topics. The course will be classified provided that the PhD 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.

Learning outcomes:
The student will gain an overview about various types of renewable energy sources and their comparison from the current, as well as future viewpoint of realizability and energy costs.

Class syllabus:
The lecture is based on the basic division of energies and corresponding fuels into renewable and non-renewable and provides a comprehensive and in-depth overview of all renewable energy sources, including technological, environmental, and economic aspects of their uses. Renewable primary energy sources, secondary energy sources. Current state of energy production and consumption, prognoses of energy production and consumption, classification of energy sources, energy balance of the Earth.
Hydro, wind, geothermal energy, energy from sea currents and other marine resources, including tides, heat pumps, energy from biomass and waste.
Solar Energy. Photovoltaics. Brief fundamentals of semiconductor physics, Bulk and thin film solar cells, Properties, production technology and use, Perspective materials and their properties for the use in photovoltaics.
Hydrogen energy. Properties of hydrogen. Production, storage and transport of hydrogen. Energy use of hydrogen (fuel cells, flame combustion and catalytic combustion, combustion turbines, internal combustion engines). Safety of hydrogen technologies.
Energy utilization of controlled thermonuclear reaction.

Recommended literature:
Obnovitelné zdroje energie / Miroslav Cenek ... [et al.]. Praha : FCC Public, 2001;

Princípy metód a využitie obnoviteľných zdrojov energie / Marcela Morvová. Bratislava : Knižničné a edičné centrum FMFI UK, 2008;
Jo Dewulf, Herman Van Langenhove: Renewables-Based Technology: Sustainability Assessment, Wiley 2006, ISBN: 978-0-470-02241-2;
František Janíček: Renewable energy sources 1: Technologies for a sustainable future, 2009, 2nd ed., Renesans, Pezinok, 174 s., ISBN: 9788089402052;
Pavel Augusta: Veľká kniha o energii, L.A. Consulting Agency, 2001, 8023865781, 9788023865783;
Physics of Solar Cells/ Peter Wuerfel, Wiley-VCH, Weinheim 2005;
Andreas Zuttel, Andreas Borgschulte, Louis Schlapbach: Hydrogen as a future energy carrier, Willey-VCH, 2008, ISBN: 978-3-527-30817-0

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

Notes:

Past grade distribution
Total number of evaluated students: 3

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Marcela Morvová, PhD., Mgr. Michal Stano, PhD., doc. RNDr. Tomáš Roch, Dr. techn.

Last change: 24.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAFZM/3-FEM-013/22	**Course title:** Selected Chapters from Dynamic and Numerical Meteorology
Educational activities: **Type of activities:** lecture **Number of hours:** **per week:** 3 **per level/semester:** 39 **Form of the course:** on-site learning	
Number of credits: 10	
Recommended semester: 2.	
Educational level: III.	
Prerequisites:	
Course requirements: The evaluation of the course will be in the form of a continuous (individual work) and final evaluation (oral exam). Successful completion of the course reflects sufficient orientation of the student in the issue. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of the Faculty of Mathematics, Physics and Informatics.	
Learning outcomes: By completing the course, the student acquires a comprehensive knowledge to dynamic meteorology and the theory of numerical modelling of meteorological processes for the purposes of weather forecasting and climate.	
Class syllabus: Hydrodynamic, Navier-Stokes equations, their fields of application, simplification and their solvability. Numerical solution and its comparison with analytical solution, physical parameterizations of atmospheric phenomena and their influence on the subgrid processes. Postprocessing and its utilization in practice (all kind of traffic, agriculture…)	
Recommended literature: M. Satoh (2014): Atmospheric Circulation Dynamics and General Circulation Models, SPRINGER–PRAXIS BOOKS IN ENVIRONMENTAL SCIENCES, Springer-Verlag Berlin Heidelberg, 730 pp., ISBN: 978-3-642-13573-6	
Languages necessary to complete the course: Slovak in combination with English (suggested readings in English)	
Notes:	

Past grade distribution Total number of evaluated students: 1	
ABS	NEABS
100,0	0,0
Lecturers: doc. RNDr. Martin Gera, PhD.	
Last change: 24.03.2022	
Approved by:	

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-403/22	Study Stay Abroad

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:
Active student participation.

Learning outcomes:
The student will acquire the new knowledge and practical experience with the labour organization in other foreign institutions.

Class syllabus:
Study stay in a research institution abroad approved by the guarantor or the supervisor.

Recommended literature:

Languages necessary to complete the course:
Slovak, English (literature mostly in English)

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-803/22	Supervision of a Bachelor Thesis

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

Number of credits: 10

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
By supervising a bachelor thesis, the doctoral student will be involved in scientific and pedagogical activities at the department.

Class syllabus:
Proposing the topic of the bachelor thesis related to the dissertation of the doctoral student. Consultations and supervision of the work of a student training in the laboratory. Elaboration of the supervisor's review on the bachelor thesis.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-806/22	Supervision of a Student at the Student Science Conference

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

Number of credits: 5

Recommended semester:

Educational level: III.

Prerequisites:

Course requirements:

Learning outcomes:
Supervision of a bachelor/master student during the Student Science Conference (extracurricular activity of a university student).

Class syllabus:
Critical reading of the student's paper for the Student Science Conference. Assessment of the paper from a professional and formal point of view.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 0

ABS	NEABS
0,0	0,0

Lecturers:

Last change: 14.04.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2022/2023

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAFZM/3-FEM-010/22	Use of Accelerators in Environmental Research

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

Number of credits: 10

Recommended semester: 2.

Educational level: III.

Prerequisites:

Course requirements:
The evaluation of the subject is continuous and takes place in the form of elaboration of a practicum report. The course will be classified as a graduate provided that the doctoral student proves the fulfilment of obligations at the level of at least 51%. The conditions for successful completion of the course are in accordance with the Study Regulations of FMFI UK.

Learning outcomes:
Gaining knowledge of the basic principles of acceleration of charged particles and the possibilities of their use in environmental research. Students will be able to use various radionuclides in accelerated mass spectrometry to study environmental processes.

Class syllabus:
Basic principles of particle acceleration. Analytical methods using accelerated ions. Accelerator mass spectrometry (AMS) - principles and applications. Sample preparation. Ion sources. Radioactive isotopes in the environment. AMS in archeology, geology, hydrology, biology and biomedicine, in pollution and material studies, in food and healthy nutrition industry.

Recommended literature:
Accelerator mass spectrometry : Ultrasensitive analysis for global science / Claudio Tuniz ... [et al.]. Boca Raton, Fla. : CRC Press, 1998

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

Notes:

Past grade distribution
Total number of evaluated students: 1

ABS	NEABS
100,0	0,0

Lecturers: doc. RNDr. Miroslav Ješkovský, PhD., prof. RNDr. Pavel Povinec, DrSc.

Last change: 21.06.2022
Approved by: