



UNIVERSITY OF PREŠOV IN PREŠOV
FACULTY OF HUMANITIES AND NATURAL SCIENCES
17. NOVEMBRA 1, 080 01 PREŠOV, SLOVAK REPUBLIC

Admission procedure for PhD studies – full time form
academic year 2025/2026

Pursuant to § 54 of Act No. 131/2002 Coll. on universities and on Amendments to Certain Acts, as amended by later regulations, the Dean of the Faculty of Humanities and Natural Sciences of the University of Presov announces the commencement of the admission procedure for PhD studies in the academic year **2025/2026** in internal and external form. The study is opened in 4 PhD study programs:

1. Anthropology in the field of study: biology

2. Environmental ecology in the field of study: ecological and environmental sciences

3. Regional geography and regional development in the field of study: earth sciences

4. Theory of Physics Education in the field of study: physics

Candidates can send applications for studies (using form [„Application for university studies, PhD - third degree”](#)) by **3 June 2025**. Admission interviews will take place on 24 June 2025.

To the application the candidate shall attach:

1. Curriculum vitae - CV
2. Notarized copies of educational qualifications (diploma)
3. Form for applicants for PhD studies (the form can be found on the faculty's website: [Faculty of Humanities and Natural Sciences, students, PhD studies, menu, Forms and documents](#))
4. A list of published and unpublished works, citations and references, peer reviews of these works, if any, and a list of the results of other professional activities
5. Submission of a project proposal (in English) on the selected topic of the dissertation
6. List of grades (from the faculty's study department)
7. Admission fee payment receipt: 50.- EUR

paid by postal order (U type) to:
Prešovská univerzita v Prešove
Dekanát Fakulty humanitných a prírodných vied
Ul. 17. novembra 1
081 16 Prešov

or by bank transfer to:
Bank: Štátna pokladnica
IBAN SK68 8180 0000 0070 0007 8256
SWIFT SPSRSKBA
Variable symbol: 103003
Constant symbol: 0308

In case of bank transfer, a signed bank transfer order, payment order or printed proof of payment via internet banking must be sent, stating the applicant's first and last name and signature. The deadline for sending is within 5 working days after payment, to:

Prešovská univerzita v Prešove
Fakulta humanitných a prírodných vied
Ul. 17. novembra 1
081 16 Prešov

The admission fee must be attached to the 3rd page of the application form, otherwise the application will not be accepted.

Filled-in applications should be sent to:

Fakulta humanitných a prírodných vied Prešovskej univerzity v Prešove

Oddelenie pre vzdelávanie

Ul. 17. novembra č. 1

081 16 Prešov

More information:: Mgr. A. Boldižárová (tel. no. 051/75 70 621, e-mail: anna.boldizarova@unipo.sk)

Dissertation thesis topics in academic year 2025/2026

Study program: Anthropology, full time study

Field of study: Biology

Prof. RNDr. Jarmila Bernasovská, PhD.

1. Genetic background of dental caries in school-age children

Supervisor: Prof. RNDr. Jarmila Bernasovská, PhD.

The thesis will focus on genetic analysis of dental caries in children of younger and older school age with a focus on children of Roma ethnicity. Data will be obtained to calculate the KPE index in Roma and non-Roma children and then candidate genes involved in dental caries will be analyzed: the gene for amelogenin (AMELX), ameloblastin (AMBN), tuftelin (TUFT1) and enamelin (ENAM) as well as tuftelin-interacting protein (TFIP11) and kallikrein 4 (KLK4).

Keywords: dental caries, KPE index, candidate genes

2. Impact of intermittent fasting on the lipid profile

Supervisor: Prof. RNDr. Jarmila Bernasovská, PhD.

Intermittent fasting has gained considerable scientific and popular acclaim, being introduced as a method of nutrition into clinical practice under certain conditions. It is a dietary method that helps to improve the lipid profile in healthy, obese and dyslipidemic individuals, lowering total cholesterol, LDL, triglycerides and increasing HDL levels. However, most studies that analyse the effect of intermittent fasting on lipid profile and weight loss are observational and lack detailed dietary information. The aim of this thesis will be to analyse diet and biochemical parameters such as traditional lipid profile - including high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol and triglycerides in the subjects studied before and after a period of intermittent fasting by means of a detailed review.

Keywords: Intermittent fasting. Biochemical parameters. Diet. Lipid profile.

Prof. MVDr. Janka Poráčová, PhD., MBA

1. Determination of genotypic and phenotypic manifestations in terms of their interaction in selected populations

Supervisor: Prof. MVDr. Janka Poráčová, PhD. MBA

A person's genotype is their unique DNA sequence. It is a designation of the two forms that an individual inherits from their mother and father for a particular gene. The phenotype is the observable expression of this genotype - the manifestation of the individual. A person's phenotype is the result of the interaction between their genotype and the environment. The connection between genotype and phenotype is not always unambiguous. There are differences between the result of an individual's genomic test and their phenotypic manifestation. Similarly, a person's phenotype focused on biochemical, hematological, anthropometric parameters may differ with a given genotype within individual populations. Currently, there is a differential view of genotype-phenotype relationships. An integrative view of diversity and uniqueness in living organisms requires a better understanding of the complex connection between genotypes and phenotypes. The genotype-phenotype relationship is best viewed as a connection between two differences, one at the genetic level and one at the phenotypic level. To date, the prevailing view in biological research is that multiple genes interact with multiple environmental variables (such as abiotic factors, culture, or symbionts) to produce a phenotype. A differential view of genotype-phenotype relationships is a useful explanatory framework in the

context of pleiotropy, epistasis, and environmental effects. Research in terms of differences clarifies the comparison between environmental and genetic effects on phenotypes and helps to better understand the relationship between genotypes and phenotypes.

Keywords: Genotype. Phenotype. Biomarkers. Human population.

Assoc. Prof. Dana Dojčáková, PhD.

1. Epigenetic mechanisms mediated by environmental factors in the pathogenesis of obesity

Supervisor: Assoc. Prof. Dana Dojčáková, PhD.

The work aims to investigate the influence of the environment on the manifestations of obesity through epigenetic mechanisms. The aim will be to investigate how environmental factors, such as dietary habits, physical activity levels, stress factors and exposure to chemical substances, influence genetic manifestations that may contribute to the development of obesity. Epigenetic mechanisms, such as DNA methylation, histone modifications and non-coding RNAs, can enhance or suppress the expression of genes that are responsible for the regulation of body weight and metabolism.

Assoc. Prof. Soňa Mačková, PhD.

1. The thin obesity phenomenon: Assessment of body composition in young adults and analysis of environmental and genetic factors in the etiopathogenesis of obesity.

Supervisor: Assoc. Prof. Soňa Mačková, PhD.

Obesity is a polygenic, multifactorial disease that results from the interaction of several environmental and genetic factors. Currently, a global phenomenon: "normal weight obesity" is a serious public health problem. Individuals with this type of obesity show significant phenotypic heterogeneity. Thin obesity, or normal weight obesity is associated with insulin resistance, inflammatory processes and endothelial dysfunction, which significantly increases the risk of metabolic disorders and cardiovascular complications, especially in young adults. A holistic approach is needed to understand the pathophysiological mechanisms involved in the etiopathogenesis of obesity. The aim of the research will be the assessment of body composition and a detailed analysis of sociodemographic, environmental and genetic factors in the context of obesity.

Assoc. Prof. Marta Mydlárová Blaščáková, PhD.

1. Evaluation of selected adipocytokines, body composition and atherogenic indexes in Slovak postmenopausal women with osteoporosis: Possible risk of cardiovascular diseases

Supervisor: Assoc. Prof. Marta Mydlárová Blaščáková, PhD.

Many research studies indicate that osteoporosis is associated with atherosclerosis and cardiovascular death. Although it is known that high plasma LDL-cholesterol (low-density lipoprotein) and low plasma HDL-cholesterol (high-density lipoprotein) concentrations are risk factors for atherosclerosis, it is unclear whether these disturbances in lipid metabolism are also related to the pathogenesis of osteoporosis. Complex lipid ratios are thought to be better predictors of coronary artery disease than individual lipid parameters. Adipocytokines secreted by adipose tissue are thought to be a potential factor in the pathogenesis of osteoporosis. The dissertation will focus on measurement of end-transients of selected adipokines (leptin, adiponectin) and monitoring of associations of body composition, plasma lipid concentrations, atherogenic indices in Slovak postmenopausal women. Through multiple linear regression model it will be necessary to determine which markers influence T-score values in Slovak postmenopausal women.

Keywords: BMD, leptin/adiponectin, TBS, plasma atherogenic index

Assoc. Prof. Eva Petrejčíková, PhD.

1. Evaluation of the teeth and jaws in historical populations from different archaeological sites

Supervisor: Assoc. Prof. Eva Petrejčíková, PhD.

The aim of this dissertation is to observe developmental anomalies, pathologies and taphonomic changes of the dentition and jaws in individuals of historical populations. The research will also include: monitoring the influence of diet and cultural habits on the degree of tooth abrasion, monitoring the levels of heavy metals in tooth enamel and dentin by analytical methods of spectrometry and spectroscopy, monitoring of dental anomalies using modern radiological methods, monitoring the eruption of both primary and permanent dentition and describing disturbances in the mechanism of tooth eruption caused by local, systemic or genetic influences, an overall assessment of the dentition of individuals of historical populations, also with regard to sex and developmental differences, but also with regard to population variation.

2. Genetics and epigenetics of osteoporosis

Supervisor: Assoc. Prof. Eva Petrejčíková, PhD.

The research work will include molecular-genetic analyzes of causal genes clinically significant in predicting the risk of osteoporotic fractures, including other complications in relation to osteoporosis, processing the results of analyses of sets of postmenopausal women with risk genotypes of selected polymorphisms of causal genes, including statistical processing of data by testing correlations of risk polymorphisms with clinical characteristics and their comparison with a control set of healthy individuals. The part of the research work will be analyses of epigenetic factors influencing the emergence and development of osteoporosis. The aim of the research will be to identify risk osteomarkers that can be used in clinical practice in the field of osteoporosis prevention.

Keywords: osteoporosis, genetic polymorphism, epigenetics

Assoc. Prof. Vincent Sedlák, PhD.

1. Application of biometric and anthropometric analysis and comparison of selected populations

Supervisor: Assoc. Prof. Vincent Sedlák, PhD.

Anthropometric and biometric analysis are currently of great interest from a biological, physiological, anatomical and ecological point of view, focusing on research into human identification characteristics (eg. anthropometric parameters and indices, dermatoglyphic parameters, iris biometrics, etc.). It is necessary to create the databases of biometric and anthropometric parameters and their analysis. Biometric and anthropometric methods also have an irreplaceable role in the administrative area, which is not one of the forensic and commercial applications. It is an area focused on identity cards and passports, which requires the speed and accuracy of verification of persons on an international scale, which underlines the topicality of this issue. Another aspect of the topic are possible associations with various biological and medical aspects of man – correlations of the frequency of individual analysed parameters with selected diseases, respectively. other biomarkers.

Keywords: Anthropometry. Biomarkers. Biometrics. Identification. Papillary lines. Iris.

Assoc. Prof. Ivan Uher, PhD.

1. The Influence of Selected Lifestyle Determinants on Health: A Multidimensional Approach to Well-being and Disease Prevention

Supervisor: Assoc. Prof. Ivan Uher, PhD.

Consultant: Assoc. Prof. Iveta Cimboláková, PhD.

The dissertation examines the influence of selected lifestyle determinants on human health with emphasis on their role in disease prevention and overall well-being. The study will integrate epidemiological, psychological, and neuroscientific perspectives to assess how factors such as physical activity, nutrition, sleep quality, stress management, and social engagement contribute to health outcomes. Particular attention will be paid to the interplay of these determinants as they affect the prevention of chronic diseases, including neurodegenerative disorders. The research will use a mixed methods approach that combines quantitative health data with qualitative lifestyle assessments. The findings of this study will provide the basis for evidence-based recommendations to optimize health and promote longevity.

2. Neuroplasticity, Interoception, and Present-Moment Awareness: The Role of Lifestyle Determinants in Health and Well-being

Supervisor: Assoc. Prof. Ivan Uher, PhD.

Consultant: Assoc. Prof. Iveta Cimboláková, PhD.

This dissertation examines the relationship between lifestyle determinants and their impact on neuroplasticity, interoception and present moment awareness, highlighting their influence on health and disease prevention. It examines how mindfulness practices, physical activity, nutrition, sleep, and stress management contribute to brain adaptability, emotional regulation, and overall well-being. By integrating insights from biology, neuroscience, psychology, and health sciences, the study explores how increasing interoceptive awareness and cultivating a focus on the present moment can promote resilience, cognitive function, and overall health. Using mixed methods, including physiological measurements and self-report data, the research aims to provide insights into optimizing lifestyle strategies for long-term neurocognitive health and quality of life.

Conditions for accepting applicants:
<ul style="list-style-type: none">• completed university education in biology or in a related field (MSc)• language requirements• a prepared written project (in English) on the selected topic of the dissertation thesis• an overview of knowledge in the addressed issue
Entrance exam content:
<ul style="list-style-type: none">• verbal exam in the subjects: molecular biology, genetics, anthropology• presentation of a completed project on a selected topic for the dissertation thesis
Contact person:
<i>prof. RNDr. Jarmila Bernasovská, PhD.</i> mail: jarmila.bernasovska@unipo.sk Department of Biology, p.n.: 051/75 70 369

Prof. PaedDr. Ján Koščo, PhD.

1. Interference of aquaculture and invasive fish species

Supervisor: Prof. PaedDr. Ján Koščo, PhD.

Aquaculture, which primarily refers to the farming of fish, also involves the trade in live freshwater fish, which consists of their import, transfer, and distribution (Kerr et al. 2005). Out of the 1,649 freshwater fish establishment events listed in FishBase (Froese & Pauly 2022), 42% are the result of species introduced through aquaculture due to fish escaping from the aquaculture facilities also be accidentally released instead of or along with the intended fish, following the misidentification or careless culling of stocks (Mandrak & Cudmore 2010). The live fish trade is a significant vector for the transportation of nonnative fish. The importance of the aquaculture pathway is expected to increase in the future worldwide and in nonnative fish aquaculture in most tropical developing countries (Vitule et al. 2019). In Slovakia, we have 197 fish farmers registered with the State Veterinary and Food Administration of the Slovak Republic (as of May 31, 2023) with a production of over 100 kg, of which approximately 50% breed "cold-water fish" (rainbow trout, brown trout, brook trout and grayling and 50% "warm-water species", such as common carp, grass carp, silver carp, tench, zander, pike and European catfish, among which there are also non-native species. In addition to farmed fish, other non-native fish species that are not bred but occur in aquaculture facilities (gibel carp, topmouth gudgeon, pumpkinseed, etc.) are also introduced into the environment outside farms. The intensity and their spread, direction of spread, or impact on the production of farmed fish is not fully known. The dissertation should contribute to a better understanding of the issue.

Assoc. Prof. Lenka Bobuľská, PhD.

1. Diversity and Biochemical Activity in Wetlands: The Impact of Environmental Factors on Microbial Communities

Supervisor: Assoc. Prof. Lenka Bobuľská, PhD.

Wetlands represent unique ecosystems with a significant role in the global carbon cycle and climate regulation. Microorganisms play a key role in the decomposition of organic matter, methanogenesis, and other biogeochemical processes occurring in these unique and pristine ecosystems. This dissertation thesis focuses on analyzing the diversity and activity of microbial communities in various types of peatlands to identify environmental factors influencing their structure and function. Several environmental factors can influence the diversity and activity of microorganisms in wetlands, with the most important being physicochemical properties, chemical composition, hydrological conditions, and biotic interactions. Using modern metagenomic methods, spectrophotometric analyses, and enzymatic assays, dominant microbial groups and their metabolic activity will be characterized. The results of this study will contribute to a deeper understanding of peatland microbial ecology and their role in ecosystem processes, which is crucial for the conservation of these sensitive habitats in the context of climate change.

Assoc. Prof. Lenka Demková, PhD.

1. Sustainable approaches to the prevention and control of bee parasites: effectiveness, impact on colony health and ecological consequences

Supervisor: Assoc. Prof. Lenka Demková, PhD.

Parasitic organisms represent a significant factor affecting the vitality of bee colonies, contributing to the weakening of the immune system, reducing the viability of colonies, and often leading to their mass death. This process has far-reaching consequences not only for honey production but also for other ecosystem services of bees that are dependent on pollination (e.g., maintaining ecosystem stability, biodiversity, and agricultural production). The aim of the dissertation will be to identify, design and experimentally verify biological and sustainable methods for the prevention and control of parasitic organisms of bees. The work will focus on assessing the effectiveness of these methods, their impact on the physiological state of bee colonies and wider ecological contexts, with emphasis on scientifically based, environmentally friendly and practically applicable solutions for beekeeping practices.

Assoc. Prof. Daniela Grušová, PhD.

1. Study of the plant secondary metabolites as an inovative tool for biodiversity protection

Supervisor: Assoc. Prof. Daniela Grušová, PhD.

The project focuses on the development of ecological tool with pesticidal properties from plant matrices, which will contribute to sustainable agriculture and minimize the negative effects of synthetic agrochemicals on the environment. The goal of the project is to use the potential of biologically active substances contained in different varieties of selected plant material for the preparation of innovative and environmentally friendly products which will protect natural biodiversity in association with agriculture. The main activities of the project include: a) literature review and selection best plant material; b) preparation of different types of extracts - by using different extraction methods (e.g. extraction with organic solvents, water distillation, supercritical fluid extraction, etc.) extracts will be prepared that will serve as a basis for the development of biologically active preparations; c) analysis of content and active substances - modern analytical methods such as HPLC and GC-MS will be used to identify and quantify substances such as terpenes, flavonoids, cannabinoids and other secondary metabolites; d) testing the biological activity of extracts - investigation of different biological activity on target species of weeds and pests in both laboratory and semi-operational conditions. Emphasis will be placed on safety for non-target organisms and ecological compatibility. The expected outcome of the project is the development of ecological products that will offer an effective and sustainable alternative to synthetic agrochemicals. These products will contribute to reducing the environmental burden, supporting biodiversity and increasing the efficiency of organic farming. The project thus combines modern biotechnological approaches with the needs of sustainable development in the agricultural sector.

Assoc. Prof. Peter Manko, PhD.

1. Aquatic Insect Ecology, Diversity and Bioindication in Freshwater Systems

Supervisor: Assoc. Prof. Peter Manko, PhD.

Aquatic insects represent a fundamental component of freshwater ecosystems and are widely recognized as sensitive indicators of ecological integrity. Their diversity, traits, and community structure respond predictably to a variety of anthropogenic stressors, including nutrient enrichment, habitat degradation, and climate-

induced hydrological changes. Understanding these responses is essential not only for biodiversity conservation but also for ecosystem monitoring and management. The aim of the dissertation will be to explore the ecological responses of aquatic insect communities to environmental gradients using modern ecological assessment methods. This will include the application of multivariate statistics, trait-based analyses, and ecological modelling to identify key bioindicator species and to quantify biodiversity–environment relationships. The research will contribute to scientifically robust and practically applicable bioassessment to support environmental policy, water quality regulation, and conservation planning.

Assoc. Prof. Ruslan Mariychuk, CSc.

1. Green synthesis of biocompatible carbon and metal nanoparticles for photothermal and sensing applications

Supervisor: Assoc. Prof. Ruslan Mariychuk, CSc.

The green synthesis of nanomaterials is a new trend in modern science due to their unusual optical, electric, magnetic, catalytic, and other properties. This opens up new possibilities in electronics, engineering, the chemical industry, and medicine. Therefore, there is a need for the development of new environmentally friendly, cost-effective, and time-effective methods of preparing carbon and metal nanoparticles. The project will focus on the development of advanced protocols for the synthesis of carbon nanoparticles and the phytosynthesis of biocompatible metal nanoparticles (silver, gold, platinum, etc.) using extracts (or their fractions) of selected plants that are easily available in Slovakia. The main attention will be focused on controlling the size and shape of the resulting biocompatible nanoparticles. First, the study will be focused on the preparation of plant extracts and the characterization of composition using chromatographic, photometric, gravimetric, and other analytical methods. Second, the various plant extract-mediated syntheses will be examined based on the evaluation of the properties of nanocolloid solutions using UV-Vis and infrared spectroscopy, photoluminescence, surface and transmission electron microscopy, and photothermal heating. The microbiological properties of the resulting nanoparticles will be studied for evaluation of their biocompatibility.

Conditions for accepting applicants:

The condition for admission to PhD studies in Environmental Ecology is completion of a Master's study program in the field of Ecology or in a related field. In the case of graduates of related fields, the committee will decide the possibility of PhD studies.

Form of admission procedure:

Candidates for PhD studies apply for one of the dissertation topics. The admission procedure for PhD studies begins for the applicant with the delivery of his application to the faculty. Part of the admission procedure is the entrance exam, which is held at the FHPV Department of Ecology before a committee of at least three members, appointed by the dean of the FHPV on the proposal of the trade union committee. The admission committee will evaluate the result of the entrance exam in a closed meeting. In the case of several applicants for studies, they will determine the order of success.

Determining the scope and extent of required knowledge:

The content of the entrance exam is the presentation of:

- work project focusing on the future dissertation,
- knowledge of ecology and environmental science and related fields (according to the chosen topic) at the level of a master's degree graduate.

Additional terms and conditions:

Active knowledge of one world language.

Contact person:

prof. PaedDr. Ján Koščo, PhD.

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Assoc. Prof. Vladimír Čech, PhD.

1. Geographical aspects of underground tourism

Supervisor: Assoc. Prof. Vladimír Čech, PhD.

The activities of human society in the field of tourism have been oriented towards new progressive forms and areas, especially in recent times. In addition to the "classical" forms and ways of spending leisure time in connection with tourism, other forms and ways that have not been so widespread until now are also dynamically developing. One such form of tourism is adventure tourism, which is differentiated mainly by the environment in which its activities are carried out. Underground tourism is often classified as adventure tourism. It is carried out in underground spaces, and natural underground spaces are distinguished - caves and chasms, tunnels in glaciers, lava tunnels, etc. and artificial (anthropogenic) - mine corridors and shafts, underground catacombs, canals, cellars, etc. The most typical underground tourism is a classic tour of a cave with artificial lighting, with a guide, along prepared paths with railings. However, there are several activities that are more adventurous and are related to underground spaces. They can be carried out in cave spaces (secured caving, underground via ferrata) and artificial ones (mining trekking, etc.). There is no work in the professional and scientific literature that deals specifically with underground tourism, there are only brief mentions of this form with basic divisions. In particular, there is a lack of a proposal for the internal structure and division of underground tourism, a mapping of the current state and a prediction of future developments in this area. The aim of the dissertation will be a comprehensive geographical analysis of the issue of underground tourism, also focusing on a specific region.

Assoc. Prof. Radoslav Klamár, PhD.

1. Quality of life and its spatial differentiation in the context of regional development

Supervisor: Assoc. Prof. Radoslav Klamár, PhD.

The dissertation focuses on the issue of quality of life and its spatial differentiation with regard to the potential of regions and their development. The assessment of quality of life will be based on its two basic dimensions, namely objective (based mainly on quantitative data) and subjective (mainly on qualitative data and preferences of residents). Their assessment will be defined by a set of selected socioeconomic indicators representing basic domains or areas of life. Several assessment methods will be used, such as the point method (serving to compare the level of quality of life in the assessed territories), regression and correlation analysis (aimed at assessing the intensity of dependence between quality of life and selected indicators) and the principal components analysis (determining the factors that most influence quality of life). Knowledge of the quality of life and preferences of residents is important both from the perspective of further setting and focusing support for regional development as well as the preparation of regional development strategies oriented towards the population and its living needs.

Assoc. Prof. Štefan Koco, PhD.,

1. Using machine learning tools in assessing erosion risk of agricultural soils

Supervisor: Assoc. Prof. Štefan Koco, PhD.

Determining soil erosion risk is a process that places high demands on the quality and accepted quantity of input data representing erosion factors. In the field of geographic information systems development, the

possibilities of using machine learning procedures as a subset of artificial intelligence, in which algorithms learn from data and improve with experience without being explicitly programmed, are increasingly being applied. In geographic research, they more effectively automatically recognize complex patterns and make decisions based on input spatial data. The work will focus on the use and parameterization of machine learning tools in the classification of input factors and the quantification of soil erosion. Machine learning techniques have the potential to estimate soil erosion by quantifying the linear or nonlinear relationship between soil erosion and its input factors (e.g. slope, vegetation cover, soil moisture). The proposed approach to integrating machine learning into soil erosion modeling will be tested in a small catchment area and subsequently implemented across the entire agricultural landscape of Slovakia. Integrating machine learning into soil erosion analysis has far-reaching potential for sustainable land management. This data-driven approach will provide practical insights into agricultural practice, optimize agricultural practices, mitigate erosion risks, and support environmentally conscious land use.

Assoc. Prof. Vladimír Solár, PhD.

1. Changes of land cover in the hinterland of water reservoirs of the Slovak Republic in the context of socio-economic and natural conditions

Supervisor: Assoc. Prof. Vladimír Solár, PhD.

The dissertation deals with the structural changes of the land cover, which occurred with the construction of water reservoirs in Slovakia during the 20th century and had a significant impact on the natural and socio-economic environment in their hinterland. The basic research is focused on the comparison of available aerial or satellite images in the environment of Geographic Information Systems, which have a wide range of tools suitable for the interpretation and assessment of land cover. The identification of factors and conditions determining changes in selected study areas of the Slovak Republic is also an important basis for a thorough treatment of the topic. The main aim of the thesis is the analysis of land cover in the hinterland of water reservoirs of the Slovak Republic from the temporal-choric aspect. In accordance with the aim, the land cover at the fifth hierarchical level in three time horizons is elaborated. As a result, the social impact is interpreted in the context of fundamental landscape changes identified on the basis of the land cover assessment.

2. Trends in the development of land cover in protected areas of the Slovak Republic in relation to biodiversity

Supervisor: Assoc. Prof. Vladimír Solár, PhD.

The thesis deals with the long-term evolution of land cover in protected areas of the Slovak Republic with regard to their biodiversity. The present research on the basis of available historical maps and orthophoto maps is carried out in the environment of Geographic Information Systems. It is complemented by field research, where problem classes of landscape cover are identified. The analysis of land cover is at a detailed scale at the fifth hierarchical level just from the aspect of biodiversity assessment. The main objective of the thesis is to determine the trends of land cover development in protected areas of the Slovak Republic. Subsequently, the relationships and dependencies between the development of land cover and biodiversity of the studied areas are identified. The results of the work can be subsequently used in decision-making processes related to landscape protection as well as its organization.

Conditions for accepting applicants:

Submission of a project proposal (in English) on the selected topic of the dissertation (on a prescribed form), with specified goals of the research.

Entrance exam content (oral exam):

- Geography (master's degree graduate level – areas stated below),
- presentation of the project on the selected topic of the dissertation (5 minutes).

Areas of questioning:

1. Human geography (methods and techniques of human geography research, geographical interpretation of issues related to population, settlements, transport, productive and non-productive activities of human society).
2. Physical geography (methods and techniques of physical geography research, geographic interpretation of the issues studied by physical geography).
3. Political geography and geopolitics.
4. Regional geography and theories of regional development.
5. Geoecology.
6. Fundamentals of geoinformatics.

Contact person:

prof. Ing. Jozef Vilček, PhD.

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Department of Geography, p.n.: +421 51 757 0393

Assoc. Prof. Sergej Il'kovič, PhD., univer. profesor

1. Implementation of an alternative measurement system into the teaching process of secondary school students in the context of educational reform

Supervisor: Assoc. Prof. Sergej Il'kovič, PhD., univer. profesor

The work focuses on the implementation of the uLAB measurement system (MS), developed at the home workplace, into the teaching process of science subjects, especially physics, and to study its impact on the quality of education. The main objective is to adapt students' experimental activities in science subjects so that they can be implemented by the MS, taking into account the ongoing educational reform. The research will include checking the level of students' understanding of knowledge and their ability to think critically, to think in wider contexts and to come up with their own solutions, which may be theoretical, experimental and technical in nature. The conclusions of this research will be used both for the continuous improvement of the features of the MS itself and for the optimization of the didactic content created..

Assoc. Prof. Miriam Spodniaková Pfefferová, PhD.

1. The Use of Artificial Intelligence for Personalized Learning in Physics

Supervisor: Assoc. Prof. Miriam Spodniaková Pfefferová, PhD.

This thesis focuses on exploring the use of available AI tools (e.g., ChatGPT, Google Gemini, Khan Academy AI Tutor, etc.) for personalized physics learning. The main objective is to analyze the effectiveness of these tools in providing individualized support, improving the understanding of physics concepts, and increasing student motivation at the high school level. In the first phase of the research, a systematic analysis of existing AI solutions and the definition of scenarios for their implementation in the teaching process will be conducted. These scenarios include using AI as an individual tutor, a diagnostic tool for identifying student errors, and a personalized task generator. The experimental part of the work will be carried out on a selected sample of pupils, comparing results before and after the implementation of AI tools using non-standardized tests and questionnaires. Additionally, methodological materials for physics teachers will be developed, including recommendations for integrating AI into the classroom and practical guidelines for using these tools in various educational contexts.

Conditions for accepting applicants:

Graduation in the Master's program – Teacher Training in Physics. The application form must include a project proposal of the future dissertation and an overview of previous scientific works and publication activities.

The mandatory conditions for admission to the PhD study programme are:

- master's degree in Teacher Training in Physics and related fields,
- submission of a project (in Slovak, English) on the selected topic of the dissertation,
- language proficiency in at least one world language at the level of matura's exam (B2).

Entrance exam content:

The main condition of admission is passing the admission interview. During the admission procedure, the applicant's academic performance throughout his/her university studies, world language proficiency, publications, and qualifications for scientific work are considered. In addition, applicants are expected to be able to:

- transform scientific knowledge into a didactic system of physics,
- demonstrate the ability to solve a research problem, including the use of pedagogical research methods and techniques,
- present the main areas of the pedagogical research project for the chosen topic of the dissertation,
- demonstrate language proficiency for studying foreign literature,
- demonstrate knowledge about research institutions and research groups working on the research of related phenomena in the field of didactics, to which the dissertation belongs and with which the candidate is applying.

Areas of questioning:

1. Didactics of physics – current state of physics didactics, problems and trends of teaching physics at primary and secondary schools
2. General physics
3. Fundamentals of pedagogical research

Recommended literature:

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