

GEOGRAPHY-METEOROLOGY DOCTORAL PROGRAM

Head of Program: Prof. Dávid Karátson

FÖL/1/3 Historical geography (Róbert Győri)

6 credits, practice, optional, non-repeatable

Disciplinary and conceptual connections between history and geography. Historical geography and settlement history. Categories of historical geography. Historical data sources. Specific methods for processing historical material; use of geographical analytical tools.

FÖL/1/4 Social environment of settlements (Éva Izsák)

6 credits, practice, optional, non-repeatable

Definitions, content, and interpretations of the environment. Social environment. Relationship between natural and social environments. Shaping and protecting the environment. Delineation, levels, and spheres of influence. Urban agglomerations as unique environmental systems.

FÖL/1/5 Intraurban processe (Éva Izsák)

6 credits, practice, optional, non-repeatable

Concepts of settlements and settlement classes. Spatial trajectories. Classic settlement models and modern urban spaces. Urban segregation. Settlement management and development.

FÖL/1/6 Methods of regional analysis I. (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

Regional databases. Spatial distribution methods. Regional inequalities. Measuring complex concepts in regional research; multivariate methods.

FÖL/1/7 Methods of regional analysis II. (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

Regional models. Spatial interaction. Spatial autocorrelation and autoregression. Methods for analyzing spatial patterns.

FÖL/1/14 Late Glacial and Holocene Environmental Change I. (Enikő Magyar)

6 credits, theoretical, optional, non-repeatable

Significance of understanding the most recent geological period; complexity of research. Critical review of various geoscientific and biological research methods. Dating methods and their challenges. New classification of the period. General characteristics of individual phases.

FÖL/1/15 Late Glacial and Holocene Environmental Change II (Enikő Magyar)

6 credits, theoretical, optional, non-repeatable

New geomorphological research results in Hungary: Climate- and tectonic-controlled rhythmic changes in fluvial erosion and accumulation; deflation periods; lake level fluctuations; changes in vegetation and soil cover.

FÖL/1/16 Loess stratigraphy and Plesitocene environmental changes in Hungary (Erzsébet Horváth)

6 credits, theoretical, optional, non-repeatable

Climate of the Carpathian Basin during the Pleistocene. Surface formation and sedimentary environments in the Carpathian Basin during the Pleistocene. Characteristics of loess; theories of loess formation. History of loess research in Hungary. Traditional and new methods for examining loess; results. Dating methods applicable to loess. Critical review of results obtained from dating methods applied to loess. Current state of loess stratigraphy in Hungary; latest results.

FÖL/1/17 Traces of Pleistocene Climate Change in Loesses (Erzsébet Horváth)

6 credits, theoretical, optional, non-repeatable

Conditions for the formation of loess-paleosol sequences in the Carpathian Basin. Characteristics of soils formed on loess. Environmental change indicators in loess. Macro-, meso-, and microscopic examination of loess and paleosols. Comparison of results from loess exposures in different areas of the Carpathian Basin, emphasizing the significance of local factors. Difficulties in correlating results and drawing a general paleogeographical picture based on loess examination.

FÖL/1/18 New results in volcanic geomorphology (Dávid Karátson)

6 credits, theoretical, optional, non-repeatable

Review of theoretical foundations. I. Main volcanic processes: effusive and explosive eruptions. II. Volcano types: shield volcanoes, composite (strato) volcanoes, pyroclastic cones. Development and formation of volcanic cones. Eruption characteristics, rates, duration, morphometric changes. Structure of volcanic cones based on SRTM: the example of the Northeastern and Eastern Carpathians. Degradation of volcanoes and volcanic areas: the role of internal and external forces.

FÖL/1/20 Paleomagnetic Research in the Carpathian-Pannonian Region (Emőke Mártonné Szalay)

6 credits, theoretical, optional, non-repeatable

Introduction, disciplinary overview. Review of theoretical foundations. I. Main volcanic processes: effusive and explosive eruptions. II. Volcano types: shield volcanoes, composite (strato) volcanoes, pyroclastic cones. Development and formation of volcanic cones. Eruption characteristics, rates, duration, morphometric changes. Structure of volcanic cones based on SRTM: the example of the Northeastern and Eastern Carpathians. Degradation of volcanoes and volcanic areas: the role of internal and external forces. Volcanic reconstruction models and surface development of volcanic mountains in Hungary. Case studies from other volcanic regions of the Carpathians, with special regard to the Eastern Carpathians. Surface development of central cones and volcanic aprons. Case studies from other volcanic regions of the world. Morphometry of volcanic forms and modeling of surface processes. Independent task: GIS-based processing of a selected volcano (DEM creation, preparation and evaluation of derived maps).

FÖL/1/21 Methods of Remote-sensing in physical geography (László Mari)

6 credits, theoretical, optional, non-repeatable

The course provides an overview of the visual and computer-aided evaluation of aerial and satellite images. Types of aerial and satellite images. Methods of land cover mapping. Structure, creation, and usability of CORINE databases (CLC1990, CLC2000, CLC-Change, CLC2006) in geographical research. Evaluation of Landsat 5 TM, Landsat 7 ETM+, and SPOT 4,5 images; analysis of different color composites. Possibilities of directed and undirected classification of satellite images. Calculation and interpretation of indices (vegetation, NDVI, drought, material, etc.).

FÖL/1/22 Digital Terrain Analysis of Karst Areas (Tamás Telbisz)

6 credits, theoretical, optional, non-repeatable

Basics of karst morphology (small and large-scale surface forms of karst areas from karren to poljes). Morphometric studies in karst areas (karren, dolines, etc.). Theories of karst surface development. Simulation of karst surface development. Theoretical basics of digital terrain analysis. Software for digital terrain analysis (Surfer, ArcView). Analysis of karren using digital elevation models. Analysis of doline karsts using digital elevation models. Application possibilities of the methodology in other scientific fields.

FÖL/1/24 Models of karst processes (Tamás Telbisz)

6 credits, theoretical, optional, non-repeatable

Basics of karst morphology (small and large-scale surface forms of karst areas from karren to poljes). Morphometric studies in karst areas (karren, dolines, etc.). Theories of karst surface development. Simulation of karst surface development. Theoretical basics of digital terrain analysis. Software for digital terrain analysis (Surfer, ArcView). Analysis of karren using digital elevation models. Analysis of doline karsts using digital elevation models. Application possibilities of the methodology in other scientific fields.

FÖL/1/26 Ice Age Earth - Methods Reconstructing Quaternary Climate and Terrestrial Environments (Erzsébet Horváth)

6 credits, theoretical, optional, non-repeatable

Global signs of climate change. Ocean-ice sheet interactions and climate change. Pleistocene glaciations in Europe. The loess record in the Northern Hemisphere. Upside down: loess in the Southern Hemisphere. Lower Pleistocene marine environment in the southern part of the North Sea. Refining the glacial and interglacial record: TIMS 230U/Th, 14C, and luminescence dating methods at the Hannover GGA Institute. Ice Age. Earth and Man. Climate change from the present to the future.

FÖL/1/37 Climate-theory (Judit Bartholy)

6 credits, theoretical, optional, repeatable

Elements of the climate system. Modeling the radiation balance. Characteristic mechanisms of climate change. Hierarchical system of climate models, their limitations. Significant feedback mechanisms of the climate system. Modeling possibilities of the climatic past and future. Global model results, climate scenarios. Embedding regional models into global models. Methodological possibilities and results of regional downscaling. Latest results of international climate modeling projects carried out with international cooperation.

FÖL/1/39 Micrometeorology (Tamás Weidinger)

6 credits, theoretical, optional, non-repeatable

Modeling molecular and turbulent diffusion, transport of momentum, energy, and trace gases. Measurement methods of the surface layer and turbulent exchange. The surface layer as the starting and endpoint of the atmospheric branch of geochemical cycles. Microclimate of enclosed spaces. Special microclimates (inhomogeneous surfaces, forests, cities, lakes, oceans). Application possibilities of micrometeorology in solving environmental problems.

FÖL/1/46 Geographical aspects of wind-energy (Béla Munkácsy)

6 credits, theoretical, optional, non-repeatable

Fundamental relationships of sustainable energy management. Environmental regulation and wind energy. Wind as an energy source. Wind turbines as energy-producing systems: their development and types. Geographical characteristics of wind energy applications; regularities of technology spread. Life cycle of wind turbines, or environmental impact of turbines. Impact of wind turbines on birdlife. Wind turbines and landscape protection. Wind energy in spatial planning I. – German practice. Wind energy in spatial planning II. – Hungarian practice. The role of geoinformatics in the environmentally friendly application of wind energy. Wind energy in practice – field program.

FÖL/1/52 New processes in the European urbanisation (Éva Izsák)

6 credits, theoretical, optional, non-repeatable

The lectures focus on European territorial processes of gentrification, segregation, suburbanization, and city formation, with special regard to changes after 1990.

FÖL/1/55 Air pollution – meteorology (Róbert Mészáros)

6 credits, theoretical, optional, non-repeatable

Current issues in the meteorology of air pollution. Dispersion and deposition models of different scales. Model parameterizations. Relationships between regional climate change and air pollution.

FÖL/1/56 Social GIS (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

Relationship between geoinformatics and social research. Regional analytical methods using geoinformatics tools. Settlement geoinformatics, business geoinformatics, and other socio-economic applications. Domestic and international examples from geoinformatics problem-solving to territorial information systems.

FÖL/1/59 Spaces on Information Society (Ákos Jakobi)

6 credits, theoretical, optional, non-repeatable

Territorial consequences of interpretative differences of the information society. Categories of space in the information society. Characteristics of virtual space. Territorial inequalities in the information age. Domestic and international examples from the geography of the information age to territorial information society development.

FÖL/1/62 Regional Models (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

Models in the spatial research of society and economy. New directions and methods of quantitative geography. Spatial statistical methods, spatial parameter studies. Domestic and international examples of the possibilities of regional modeling.

FÖL/1/66 Investigation of climate-change with global model (Rita Pongrácz)

6 credits, theoretical, optional, non-repeatable

Application of global climate models to study climate change. Comparative analysis of climate change simulations using the EdGCM global climate model runnable on PC. The 8°×10° horizontal resolution EdGCM model is run globally on a centennial time scale with the definition of different scenarios. The model results are compared using the main climate variables, primarily

temperature, precipitation, and various radiation parameters. Auxiliary software for mapping and graphical display is used to track estimated climate changes.

FÖL/1/68 Interpretation of Fossile Quaternary Forms (Balázs Nagy)

6 credits, theoretical, optional, non-repeatable

Analysis of inactive landforms – formed during the Quaternary

- possibilities of identification, research methods
- analysing the role of environmental development
- analysing the conditions of formation
- inactive forms as paleoenvironmental infocarriers
- the processes of landform „fossilization”, transformations in landforms
- changes in geomorphological dominance

The course is based on case studies, but receives a significant role of student work: the interpretation and explanation of own literature-based projects

FÖL/1/69 Theoretical and Methodological Issues in Urban Geography (Éva Izsák)

6 credits, theoretical, optional, non-repeatable

The aim of the course is to introduce students to theoretically grounded and methodologically important and new directions. The course introduces the classical research methods of urban geography as well as contemporary research directions. It analyzes qualitative, quantitative and mixed methods in detail. Its task is to place urban geography within the discipline of geography and among the social sciences. They can also learn about the main paradigms and critical research.

FÖL/1/72 Automatisatation in regional research (Gábor Szalkai)

6 credits, practice, optional, non-repeatable

The aim of the course is to enable students to acquire practical skills in using the VBA environment and programming language behind Excel, so that upon completing the course they are able to automate the transformation of data tables commonly encountered in spatial analyses, and to easily perform tasks that are difficult to accomplish using the standard menu system. The main topics of the course include the VBA framework, an introduction to variables, loops, conditional statements, arrays, and the declaration of forms.

FÖL/1/83 History of Meteorological Modeling of Surface-Atmosphere Interactions (Ferenc Ács)

6 credits, theoretical, optional, non-repeatable

FÖL/1/89 Characteristics of Spatial Structure (Pál Szabó)

6 credits, practice, optional, non-repeatable

The aim of the course is to provide a more thorough understanding and research of the spatial structure characteristics and processes (e.g., economic and geographical center-periphery) of countries in Europe and around the world. The course involves the presentation and study of domestic and foreign literature on spatial characteristics, as well as the processing and analysis of various regional social and economic statistical data from a spatial perspective. Through these, the different traditional and new spatial characteristics of each region become known.

FÖL/1/90 Regional Processes in Europe (Pál Szabó)

6 credit, practice, optional, non-repeatable

The aim of the course is to familiarize students with the regional socio-geographical characteristics and processes of Europe and to conduct research from a territorial perspective. The course presents and studies the latest domestic and foreign literature, and analyzes various traditional and new regional social and economic statistical data (mapping, processing using various statistical methods). Through these, the regional processes (e.g., economic agglomeration, territorial concentration) taking place at different territorial levels of the continent, which are decisive today and thus form the basis of various (EU, national, regional) territorial policies, become known as comprehensive social characteristics and regional specifics.

FÖL/1/91 GIS in Socio-Economic Analysis (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

The course introduces the access, use and correct interpretation of socio-economic territorial databases available in electronic forms, which can also be used for GIS visualisation and analysis. The course deals with the spatial resolution of different socio-economic phenomena and with the related public or commercially available statistical data sources. Students learn how to fit socio-economic data needs to the existing regional statistical databases and how to transfer it to analytical inputs from a methodological point of view. Students also learn to avoid misinterpretations arising from the method of statistical enumeration, and as a result to create content-adequate GIS outputs. Detailed topics in the context of spatial-social data: data addition, data replacement, homogenisation and aggregation of spatial and time series, elimination of bias due to changes in administrative positions, management of the “headquarters problem” in geolocalization, management of the effects of data protection restrictions, data estimation options. Examples of spatial-social analysis to be introduced: overlay methods, proximity analysis and spatial autocorrelation analysis on socio-economic data.

FÖL/1/93 The spatial dimensions of the global economy (Krisztina Juhász)

6 credits, practice, optional, non-repeatable

The course analyses those global economic processes whose impacts have led to the emergence of an unprecedentedly complex world economic system with wide-ranging effects. Among these effects, the course primarily focuses on territorial consequences, interpreting them from the local and regional scale up to the level of the world economy. Starting from the socio-economic interpretation of globalization, the course outlines the fundamental changes taking place in the world economy, discussing the main characteristics and defining processes of the global economic era. Particular emphasis is placed on the economic and territorial impacts of technological development, as well as on transnational corporations as key actors of the global economy. The course provides insight into the activities of these economic actors, focusing especially on their economic and, above all, territorial (local, regional, national) dimensions. As a separate thematic unit, the course addresses the theoretical and practical issues related to the international flows of factors of production (capital and labour), as well as goods and services, and examines their effects on the transformation of the spatial structure of the economy.

Among the different spatial scales, the course highlights the level of nation-states (countries), seeking answers to how global (world-scale) economic processes reshape the room for manoeuvre and roles of countries within this system, and how power relations change among global economic actors (states, transnational corporations, international organisations). In conclusion, the course supports the thesis that despite worldwide processes and factor flows, spatiality remains a decisive issue in today's economic environment. It outlines the impact of globalization on global territorial inequalities, distinguishing between winning and losing regions

and describing their characteristics. The course covers the above topics using a variety of teaching methods (lectures, group work, student presentations, article and book analyses, etc.), while consistently relying on and expecting the active participation of students throughout the semester. Given their broad scope, the topics mentioned serve primarily as a framework for the semester's work; within this framework, specific issues are analysed in line with the students' research interests. The requirement for completing the course is the preparation of a term paper—agreed upon in advance with the instructor and related to the student's doctoral research topic—and the oral presentation of its results. At the end of the semester, students' performance is evaluated by the instructor based on their in-class work and the term paper.

FÖL/1/94 The Geographies of Socialism and Post-Socialism (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

The PhD course is aimed at geographically investigating social and economic processes in former socialist and contemporary post-socialist countries, and analyzing the relevant findings of geography and other disciplines with interests in the spatial perspective. In the seminar we focus on three main issues:

1. Is it possible to identify general socio-spatial regularities in the former socialist and contemporary post-socialist world, or do these generalizing terms rather tend to hide remarkable uniqueness and specific local features at the level of countries and their regions?
2. How can we embed the spatial tendencies of both the socialist and post-socialist decades in the global processes of the same periods? Can we regard these macroregions as specific, or has the changing spatiality of their social and economic features merely resulted from factors similarly present in other parts of the world?
3. Do spatial tendencies in post-socialist countries still reflect the historical impact of the socialist period, or are they rather driven by the factors shaping the spatial realities of the entire contemporary world?

FÖL/1/95 Spatial disparity research (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

The aim of the course is to provide a complex and comprehensive overview of alternative approaches to studying spatial disparities, including a detailed analysis of related theoretical concepts and analytical methods. The course puts special emphasis on the following considerations:

1. Spatial disparity research is inseparably linked to the social, economic, and political circumstances of the historical era and geographical place in which it is conducted. This context has a firm influence on whether spatial inequality is considered as relevant research topic, and, if yes, from which aspect, at which geographical scale, and through which methods it is investigated, which normative notions are attached to it, and, in reaction to it, which practical measures are formulated. Thus, the course presents the geographies and histories of spatial disparity research.
2. In a given social, economic, and political context, various disciplines still take different approaches to spatial inequality. Therefore, the seminar takes a multidisciplinary stance to research issues spatial studies often tend to investigate in a one-sided manner, relying on the perspective of a single discipline.
3. In Hungarian geography and spatial studies researchers focusing on more abstract (e.g. statistically quantifiable) aspects of inequalities pay relatively moderate attention

to complex social interrelations, while those more responsive to social aspects often tend to regard spatial disparity research as an inherently much too formal activity with little relevance for their studies. For this reason, a main goal of the course is to reveal the opportunities for a spatial disparity research with solid social scientific foundation and to identify novel and relevant approaches for contemporary research praxis.

FÖL/1/96 Energy Planning (Béla Munkácsy)

6 credits, theoretical, optional, non-repeatable

1. Introduction: Sustainability as a framework
 - Global and local challenges: climate change, energy dependence, social justice
 - Dimensions of sustainability: environmental, economic, social, cultural
2. Spatiality and energy
 - Spatial patterns of energy consumption: urban–rural differences, industrial–residential demands
 - Potentials and spatial distribution of renewable energy sources: solar, wind, biomass, ambient heat, hydropower
 - Mapping energy infrastructure: networks, storage, distribution
3. Complexity and systems approach
 - Interconnections of energy systems: production, consumption, storage, regulation (sector coupling; demand side management)
 - Interdisciplinary links: technology, society, economy, politics
 - Scenarios and pathways: visions of the future, managing uncertainty
4. Energy transition and climate neutrality
 - Decarbonisation strategies: cross-sector integration (buildings, transport, industry)
 - Energy efficiency and demand reduction: behavioural and technological tools
 - Storage and flexibility: batteries, hydrogen, sector coupling
5. Social and political dimensions
 - Energy justice: energy poverty, access, equity
 - Community participation: participatory planning, local initiatives
 - Political and institutional frameworks: EU, national, municipal levels
6. Practical tools and methods
 - Energy planning models: GIS, energy balances, simulations
 - Decision support: cost–benefit analysis, life cycle assessment
 - Communication and knowledge transfer: visualization, narratives, education

FÖL/1/98 Geography of Marginalisation (Judit Timár)

6 credits, theoretical, optional, non-repeatable

Social and spatial marginalization are in close connection. The course intends to concentrate on this relationship and to go beyond “mapping” different marginalizing social groups. It will explore how relations of class, gender, ethnicity, ability, age etc. and space, place, environment as well as geographical scale are mutually structured and transformed and how socio-spatial marginalization is reproduced by them. Besides structural issues, different identities, everyday experiences and practices will also be investigated. We will compare the results of some empirical studies in order to understand the peculiarities of the international and Hungarian contexts. However, different approaches, concepts will also get great emphasis. Learning about the views and critiques of political economic, Marxist, feminist, social-constructivist social theories may be used effectively in a lot of geographical studies of social space. The method of the course based mainly on literature review and critical discourses can contribute to the better understanding of

socio-spatial marginalization in particular and to the theoretical soundness of the doctoral studies in general.

FÖL/1/99 Streams in rural geography (Judit Timár)

6 credits, theoretical, optional, non-repeatable

Rural geography has a long tradition in Hungary. However, the professionalization of this sub-discipline similar to the one in Western geographies has not been accomplished yet. Recent doctoral studies can contribute to this process through theoretical soundness. This course intends to deepen theoretical knowledge. We will study the international characteristics and the Hungarian peculiarities of the adaptation and possibilities of the functionalist, political economic, social-constructivist approaches in rural geography. We will discuss the main arguments of the academic debates on the “modern”, “post-modern” and “post-rural”, as well as the influences of the cultural turn, and how to apply the concept of the production of space. We will investigate how feminist perspective could renew rural studies. The comparison of the “East–West”, “South–North” differences/similarities in producing and using conceptional and analytical frameworks in actual researches and in discussing theories by rural geographers will also be the subject of the course. The method will be critical analysis and discussion of the literature.

FÖL/1/104 New Approaches to Urban Studies (Márton Berki)

6 credits, theoretical, optional, non-repeatable

- Antecedents of urban studies – From Daniel Defoe to Georg Simmel;
- The urban ecology of the Chicago School and its critiques
- The impact of the behavioural turn and mental mapping on urban studies
- The emergence and impact of neo-Marxist urban political economy
- The Los Angeles School and the theorising of postmodern urbanization
- Urban studies in Central and Eastern Europe – Socialist cities
- Urban studies in Central and Eastern Europe – Post-socialist cities
- Dependency theory, world-systems theory and urban studies
- Urban studies in post-colonial societies and the concept of comparative urbanism
- The concept of planetary urbanization

FÖL/1/105 New Approaches to Cultural Geography (Márton Berki)

6 credits, theoretical, optional, non-repeatable

From 1989 onwards, the politico-economic transition of Central and Eastern European countries undoubtedly brought a conceptual diversification in terms of the approaches to human geography in Hungary as well; nonetheless, as a significant (and still existing) research gap, the sub-discipline of cultural geography was largely left untouched by these changes. Although ‘new cultural geography’ turned out to be one of the most vital fields of Anglo-American human geography by the turn of the 1980s and 1990s, geographers of Central and Eastern European countries placed relatively little emphasis on research foci associated with it (such as the spatiality of subcultures, the practices of everyday life, landscape iconography, the role and multiple meanings of artistic representations, the questions of identities and the body etc.). In order to (at least partly) fill this gap, the aim of the course is to provide an overview of the theoretical underpinnings and the main research topics of ‘new cultural geography’ and more contemporary (non-representational or more-than-representational) cultural geography.

FÖL/1/106 Geographies of Big Data and the Information Society (Ákos Jakobi)

6 credits, theoretical, optional, non-repeatable

Different concepts and interpretations of the information society. How does the information society influence data generation processes? Digital divide. Geographical differences in information society development, statistical measuring of regional inequalities. Concepts of the information economy and the challenges of industry 4.0. The “death of distance” theory, the relationship between location independence, location dependence and geoinformation. ICT strategies and tools for regional development. The social and geographical implications of the „big data” concept. Digital traces: direct spatial data (human sensing, mobile communication spatial data). Digital traces: indirect spatial data (transaction data, web usage spatial data). Digital traces: indirect spatial data (spatial components of social media data, online social networks). The concept of smart cities, the “data-driven city”, and e-government in space. The phenomena of the “surveillance society” and the GDPR regulation. The concept of virtual space (cyberspace), relationships between virtuality and reality.

FÖL/1/110 Quaternary Geochronology (Ágnes Novothny, Zsófia Ruzsáczay-Rüdiger, Zoltán Kern)

6 credits, lecture, optional, non-repeatable

FÖL/1/111 Weather and Climate Models (Hajnalka Breuer)

6 credits, theoretical, optional, non-repeatable

During the course of the lectures the students will get an insight to the theoretical and practical principles of the models and modelling, the physical and mathematical background of the model components will also be presented. Students who have never worked with or never have learned about modelling are also encouraged to enrol.

Topics:

1. What does the term model mean? Basic concepts, background and development of modelling
2. Structure and operating principle of models
3. Model dynamics (physical and numerical approximations)
4. Parameterizations – radiation transfer
5. Parameterizations – cloud microphysics
6. Parameterizations – convective cloud development
7. Parameterizations – planetary boundary layer
8. Parameterizations – surface processes
9. Chemical module (atmospheric and oceanic)
10. Model operation – data management, initialization, technical background
11. Predictability
12. Verification and interpretation of model results

FÖL/1/113 Regional Climatemodeling Procedures in Europe: EURO-CORDEX and Med-CORDEX (Csaba Torma)

6 credits, theoretical, optional, non-repeatable

The first successful nested regional climate model (RCM) simulation was achieved over the western coasts of the United States at 60 km grid spacing (Dickinson et al., 1989), and since then

RCMs have been increasingly used for a wide range of applications, from process studies to paleoclimate and future climate simulations and seasonal predictions. In addition, due to the uncertainties inherent in regional climate projections, large ensembles of simulations are needed to extract credible signals. Over the European region several RCM-based climate change projects have been accomplished in the last two decades. In the framework of a more recent international initiative, called CORDEX (Coordinated Regional climate Downscaling Experiment; Giorgi et al., 2009) RCM simulations are completed over all continents around the world for the period: 1950-2100. In particular, as part of the EURO-CORDEX (Jacob et al., 2014), and Med-CORDEX (Ruti et al., 2016) initiative, an unprecedented set of climate change projections have been completed at resolutions of 50 km and 12 km over European domains. Such simulations are considered as the fundamental pillars of the ever-expanding literature on the investigation of the climate of Europe. The main objectives of the course are:

- principal overview of the enormous literature based on the aforementioned simulations
- their overview with special focus on:
 - The uncertainties inherent in the simulations and their sources
 - The uncertainties inherent in observations and their sources
 - bias-correction techniques
 - regional climate change
 - mean temperature and precipitation
 - extremes
 - heatwaves, floods
 - vulnerability
 - case studies
 - benefits of high-resolution regional climate modelling (added value)

FÖL/1/114 Environment and Society (Ferenc Jankó)

6 credits, theoretical, optional, non-repeatable

- **Nature, the social construction of nature**
- **Climate change**

Grundmann, R., 2016. Climate change as a wicked social problem. *Nat. Geosci.* 9, 562–563.

- **Antropocene, Technooptimism**

Steffen, W., Grinevald, J., Crutzen, P., McNeill, J. (2011) The Anthropocene: conceptual and historical perspectives. *Philosophical Transactions of the Royal Society A* 369, 842–867. doi:10.1098/rsta.2010.0327

Haraway, D. (2015) Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin. *Environmental Humanities* 6, 159–165.

Maaz Gardezi and J. Gordon Arbuckle (2020) Techno-Optimism and Farmers' Attitudes Toward Climate Change Adaptation. *Environment and Behavior* 52 (1), 82–105.

- **Biodiversity, Geodiversity, Hybridity**

Phoebe L. Zarnetske et al. (2019) Towards connecting biodiversity and geodiversity across scales with satellite remote sensing. *Global Ecology and Biogeography* 28(5), 548–556.

Jean B. Faye (2020) Indigenous farming transitions, sociocultural hybridity and sustainability in rural Senegal. *NJAS - Wageningen Journal of Life Sciences* 92, 100338

- **Political ecology**

Adams, W.M. (2017) 'Sleeping with the enemy? Biodiversity conservation, corporations and the green economy', *Journal of Political Ecology* 24, 243–257.

Willow, A.J., Wylie, S. (2014) Politics, ecology, and the new anthropology of energy: exploring the emerging frontiers of hydraulic fracking. *Journal of Political Ecology* 21 (1), 222–236. <https://doi.org/10.2458/v21i1.21134>

- **Environmental health, environmental justice**

Cupples, J. (2009) Culture, nature and particulate matter – Hybrid reframings in air pollution scholarship. *Atmospheric Environment* 43, 207–217.

Rose, J. (2014). Ontologies of Socioenvironmental Justice: Homelessness and the Production of Social Natures. *Journal of Leisure Research*, 46(3), 252–271. <https://doi.org/10.1080/00222216.2014.11950325>

Rose, J. (2019). Unsheltered Homelessness in Urban Parks: Perspectives on Environment, Health, and Justice in Salt Lake City, Utah. *Environmental Justice* 12(1), <https://doi.org/10.1089/env.2018.0023>

- **Urban ecology, Gender and the environment**

Wolch, J. (2007) Green urban worlds. *Annals of the Association of American Geographers*, 97(2), pp. 373–384

Banerjee, D. & Bell, M.M. (2007) 'Ecogender: locating gender in environmental social science', *Society and Natural Resources*, 20(1): 3–19.

Rose, J. Johnson, C.W. (2017) Homelessness, nature, and health: toward a feminist political ecology of masculinities, *Gender, Place & Culture* 24(7), 991–1010. DOI: 10.1080/0966369X.2017.1347559

- **Ecological modernization, Green technology, Greenwashing**

Hartley, W. Dickinson, N.M. Riby, P. Shutes, B. (2012) Sustainable ecological restoration of brownfield sites through engineering or managed natural attenuation? A case study from Northwest England, *Ecological Engineering*, 40, 70–79.

Virens, A. (2024) Green hydrogen futures: Tensions of energy and justice within sociotechnical imaginaries. *Energy Research & Social Science* 114, 103587

- **Agro-food systems, Land degradation and restoration**

Rafael G. Araújo et al. (2023) Agro-food systems and environment: Sustaining the unsustainable, *Current Opinion in Environmental Science & Health* 31, 100413. <https://doi.org/10.1016/j.coesh.2022.100413>.

Anderson, E., et al. (2011) The Political Ecology of Land Degradation. *Annu. Rev. Environ. Resour.* 36, 295–319.

FÖL/1/119 Programmes and Projects (Viktória Józsa)

6 credits, practice, optional, non-repeatable

Overview of the international (especially EU) and national development programmes. The Strategy Pyramid, strategic programming, hierarchy of the development programs. Local (grassroot) community initiatives, flagship projects, direct co-financing from the European Commission, cross-border development projects. Methods of monitoring and impact analysis. Planning of the next EU budgetary and programming period between 2021-2027.

FÖL/1/120 Local Economic Development Systems and New Directions in Settlement Development (Viktória Józsa)

6 credits, practice, optional, non-repeatable

Introduction to the local economic development activity. Overview of the local actors, institutional structure and impact mechanisms. The steps of the establishment of a local economic development system, analysis of international and national practices. Recent directions in settlement development (smart, innovative, sustainable and resilient). Critical analysis, opportunities to measure and monitor the achieved results, sustainability aspects and future avenues.

FÖL/1/121 Local Embedding of Companies – Theoretical Background and Practical Implications (Viktória Józsa)

6 credits, practice, optional, non-repeatable

The role of transnational companies and their supplier network (global value chains) in the world. Theoretical framework, definitions and connections of corporate embedding. The significance of foreign direct investment, restructuring and revalorisation of the traditional factors of localisation. Local embedding processes of transnational companies, specific steps of the integration to the local (urban) tissue. The responsibilities and cooperation opportunities of local actors, analysis of sustainable partnership systems and models. Identification of urbanisation and localisation effects, future development paths and tendencies.

FÖL/1/123 Synoptic Meteorology (Zsuzsanna Soósne Dezső)

6 credits, practice, optional, non-repeatable

Presentation of modern tools and methods used in weather forecasting. Diagnosis and forecasting of synoptic and mesoscale weather phenomena. Application of satellite measurements in weather forecasting. Analysis of interesting weather events. Theoretical and practical analysis of current issues in synoptic meteorology.

FÖL/1/124 Historical Settlement-geographical Study of the Structure of Transdanubian Cities (Tibor Lenner)

6 credits, practice, optional, non-repeatable

The course focuses on the analysis of urban structures, primarily illustrating the factors influencing the structure of settlements through the example of cities in Transdanubia. These factors include natural conditions, the surrounding settlement network, the legal status and main roles of the settlement, and its historical development. Using the research methods of historical geography, the course seeks to identify both distinct and shared features in their development. It

examines the medieval legal status and roles of these cities, the impacts of the Ottoman conquest, the developments of capitalism and embourgeoisement, the consequences of the Treaty of Trianon, their situation during state socialism, and their adaptation to the challenges of the regime change. By reviewing the methods of investigation and reconstruction, the course lays the foundation for doctoral research in urban geography.

FÖL/1/125 Pollen Analysis (Enikő Magyari)

6 credits, practice, optional, non-repeatable

FÖL/1/126 Water, Society, Economy (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

The aim of the course is to identify and analyze the social and economic aspects of water as a natural resource. We investigate water as a fundamental prerequisite for the functioning of society and the economy, which is though unevenly available for different social groups and at different localities. Hence, we consider water an object of social conflicts, the governance and regulation of which along socially just, economically efficient, and environmentally sustainable principles constitute a major challenge for contemporary human societies around the globe. The course takes a human geography centered but multidisciplinary approach to the complex interlinkages of water, society, and the economy, and embraces the following topics: (1) Why geography and the geographical scale matters in water issues? (2) The political dimensions of water. (3) Uneven access to water. Class, gender, and racial inequalities. Water justice. Issues of water quantity and quality. Water as a commons. (4) Food-water. Water as a decisive resource for food production. (5) Water and energy production. (6) Environmental aspects of water use. Environmental justice and political ecology. (7) Water infrastructures. Governance, legal regulation, and property relations in the urban and rural domains. (8) Water and economic development. (9) Water conflicts. Geopolitical considerations and opportunities for cooperation. (10) Water politics and the politics of knowledge on water. Mobilizing, adapting, and communicating knowledge and policies.

FÖL/1/127 Geography and Geopolitics of Knowledge (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

The course aims to scrutinize the influence of geographical and geopolitical settings on the production and mobility of knowledge and its dismissal or acceptance and application at other localities. We investigate knowledge as a social product not simply resulting from someone's spontaneous idea but the production and acceptance of which strongly depends on prevailing social, economic, and political relations, institutional structures, material and technical conditions, normative expectations, and scientific norms at a specific place. These factors are heterogenous at different geographical locations and scales and embedded in geographically uneven power relations and geopolitical contexts.

The course takes a human geography-centered but multidisciplinary approach to these complex issues, with a particular interest in the following topics: (1) Different forms of knowledge and their geographical and geopolitical aspects. (2) The loci of knowledge production. (3) Knowledge networks and their spatiality. (4) Centers of calculation, knowledge environments, academic milieus of knowledge. (5) Theoretical aspects of the mobility of knowledge. (6) The role of artifacts, techniques, and humans in the mobility of knowledge. (7) Unequal opportunity for knowledge from core regions and peripheral regions. (8) The role of urban and rural spaces in producing and disseminating knowledge. (9) A new approach: the decolonizing of knowledge. (10)

Policy mobility and its geographies. (11) Geographical and geopolitical disparities of education. (12) Spatial inequalities of educational access: institutional, cultural, racial, and gender perspectives.

FÖL/1/128 Survival Kit for Academic Life (Csaba Torma)

6 credits, practice, optional, non-repeatable

The course provides an overall comprehensive overview of the everyday life of science. During the course, students can get acquainted with relevant, most useful information related to various forms of scientific communication. The aim is for the students to get acquainted with their challenges and advantages according to the following topics. During the course we will cover the following topics:

- How can the scientific work of a researcher be measured and judged objectively?
- What are the most basic forms of the scientific communication?
- What types of scientific articles and studies exist?
- What are the different publishing forms?
- How does the proofreading process work?
- How to make a good scientific poster?
- What to look for when preparing a scientific lecture or during the lecture?
- How to write a successful proposal?

At the end of the semester, students report on the knowledge they have acquired by presenting a chosen topic / topic in the form of scientific communication of their choice.

FÖL/1/131 Health Geography (Annamária Uzzoli)

6 credits, theoretical, optional, non-repeatable

The aim of this course is the multidimensional interpretation of the relationship between the geographical environment and health/health care. In this case, the theoretical and methodological framework of human and health geography is applied to examine the socio spatial differences in health and health care. A priority task is to analyse the geographical characteristics of relevant health processes using different territorial scales (global, regional, local). A special aspect is the exploration of the spatio-temporal characteristics of the health inequalities in Hungary. In the education of this course, the different topics are explained primarily in the way of case studies, by applying the literature review and analyzing statistical data.

FÖL/1/132 Differences in knowledge production in Europe (Gergely Tagai)

6 credits, practice, optional, non-repeatable

The course will provide an overview of the different forms of knowledge production and the research directions and methodological options for exploring differences in knowledge production. We will examine critical social science theories that contribute to understanding inequalities in knowledge production. The role of research collaborations in academic knowledge production will be highlighted. From this perspective of differences in knowledge production at the European level, we will also analyse the distinctive spatial patterns and possible explanatory factors of inequalities in research collaboration, based on participation in the EU's Horizon Research and Development Framework Programmes.

FÖL/1/133 Spaces and Places in Marketing (András Kovács)

6 credits, practice, optional, non-repeatable

The course aims to extend students' spatial knowledge, spatial view and methodological apparatus to business decision making. During the course, students will review the theories (spatial theories, site selection, spatial structure, spatial processes) that are relevant and important from a business perspective. During the semester, we will address the business understanding of the concept of space, the integration of online-offline space, the problem of business location choice, the spatial structure of markets and the spatial processes of consumers and consumption in both online and offline spaces. The business implications of the interconnection of online-offline spaces will be highlighted, as well as possible marketing implications of postmodern space constructions.

FÖL/1/134 Analysis of climate data using CDO command lines (Anna Kis)

6 credits, practice, optional, non-repeatable

Most of the observation-based datasets and climate model simulation outputs are available in NetCDF format. These data files can be analysed using CDO (Climate Data Operators) command lines; spatial and temporal characteristics are easy to calculate. CDO command lines can be embedded into scripts, so more databases, time periods or variables can be managed. The main aims of the course:

- to get to know CDO command lines
- to extract the basic information of NetCDF files using CDO command lines
- analysis of climate data using perl scripts with CDO command lines

FÖL/1/135 Climate Change Scenarios (Rita Pongrácz)

6 credits, theoretical, optional, non-repeatable

The course gives an overview on the creation of the most often used scenario families since the 1990s (i.e. IS92, SRES, WRE, RCP, SSP), and how they are used in global and regional climate models. PhD students will receive information on publicly available climate simulation databases and possible tools to handle them including online tools. Before evaluating climate scenarios, it is essential to validate the simulation results, so the basic validation aspects are also summarized.

The main aims of the course:

To provide an overview on the methodology used in climate change projections and the different climate scenarios at global and regional scales in order to facilitate adaptation and mitigation strategies.

FÖL/1/136 Hungarians Across Borders: Regional Geographic Perspectives (Ferenc Szilágyi)

6 credits, practice, optional, non-repeatable

This course examines the socio-economic conditions of Hungarian communities living as minorities and in the diaspora, with special emphasis on the regions of the Carpathian Basin. Our analyses explore the historical geography of these areas, the demographic development of the communities, and the interrelations in settlement geography, demography, and economics. The course also focuses on cultural characteristics and issues of identity preservation. It contributes to an integrated understanding of current processes within the present Hungarian state territory and its border regions, including the effects of Hungarian policies on external peripheral areas. Additionally, we investigate the repercussions of neighbouring countries' policy decisions on Hungarian society, such as territorial development impacts. Finally, we analyse the role of Hungarian communities beyond the borders in regional cooperation and area development.

FÖL/1/137 Borders in the Carpathian Basin (Ferenc Szilágyi)

6 credits, practice, optional, non-repeatable

The course aims to provide a comprehensive analysis of the borders in the Carpathian Basin, encompassing fundamental issues of administrative and historical geography, as well as extending to aspects of general physical and human geography, regional development, and cultural studies. Throughout the course, we will examine the historical processes of border formation and the geopolitical and economic factors that have influenced their changes. The impacts of borders on regional development, socio-economic relations, and cultural identity will be analysed. Special attention will be given to the current challenges and opportunities of existing borders, including regional cooperation and integration within the Carpathian Basin. This course contributes to a deeper understanding of the region's complex geographical and cultural dynamics.