

DOCTORAL SCHOOL OF EARTH SCIENCES TRAINING PLAN FROM 13.03.2025

Faculty of Science

Branch of sciences: earth sciences

Type of education: PhD education

Goal of education: preparing for obtaining PhD grade and gaining practice in teaching in higher education

Duration: 8 semesters

Type of training: full-time

Funding: state-funded or fee-paying training

Requirements for entering the PhD programme: MSc/MA degree and successful entrance examination

Requirement of language proficiency: type C B2 level English language exam, recognised by the Hungarian state

The PhD programme ends with: final (pre-degree) examination ('abszolutórium')

Credits required for final (pre-degree) examination: 240

Credit types and modules: study credits, research credits, teaching credits

Professor in charge of training: Prof. Gábor Timár, full professor, head of PhD school

DIVISION OF THE TRAINING PROGRAMME

General requirements and order of the training, including those of the complex examination and issues related to the doctoral process, are the same for everyone and recorded in the ELTE Doctorate Regulation, its appendix on the Faculty of Science, and the Operational Rules of the Doctoral School.

Basic requirements for each training phases are as follows:

- Education and research phase (4 semesters)
 - Credits to be gained: 108-132 (including 36 compulsory credits from courses and 2 compulsory credits from written report)
 - Complex examination
- Research and thesis writing phase (4 semesters)
 - Credits to be gained: 108-132

Requirements for applying for the doctoral process are: final (pre-degree) examination

('abszolutórium'); fulfilling the publication and language exam criteria set by the council of the doctoral school; submitting the proceedings of the 'internal defence' or an in-depth written opinion of the supervisor; and the PhD thesis.

CREDITS FOR ALL PROGRAMMES AND MODULES THAT CAN BE ABSOLVED DURING THE TRAINING

I. GEOGRAPHY-METEOROLOGY

Head of Programme: Prof. Dávid Karátson

Training Module, courses (36 compulsory credits from courses in first 4 semesters):

FÖL/1/3 Historical geography (Róbert Győri)

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/5 Intraurban processes (Éva Izsák)

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

FÖL/1/17 Traces of Pleistocene climate change in loesses (Erzsébet Horváth)

6 credits, theoretical, optional, non-repeatable (either in English or in Hungarian, but only in one language at a semester)

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

6 credits, theoretical, optional, non-repeatable (either in English or in Hungarian, but only in one language at a semester)

FÖL/1/20 Paleomagnetic research in Carpathian-Pannonian Region (Emő Mártonné Szalay)
6 credits, theoretical, optional, non-repeatable

FÖL/1/21 Methods of Remote-sensing in physical geography (László Mari)
6 credits, theoretical, optional, non-repeatable

FÖL/1/22 Digital terrain analysis of karst areas (Tamás Telbisz)
6 credits, theoretical, optional, non-repeatable

FÖL/1/24 Models of karst processes (Tamás Telbisz)
6 credits, theoretical, optional, non-repeatable

FÖL/1/26 ICE AGE EARTH - Methods Reconstructing Quaternary Climate and Terrestrial Environments (Erzsébet Horváth)
6 credits, theoretical, optional, non-repeatable

FÖL/1/37 Climate-theory (Judit Bartholy)
6 credits, theoretical, optional, non-repeatable

FÖL/1/39 Micrometeorology (Tamás Weidinger)
6 credits, theoretical, optional, non-repeatable

FÖL/1/46 Geographical aspects of wind-energy (Béla Munkácsi)
6 credits, theoretical, optional, non-repeatable

FÖL/1/52 New processes in the European urbanisation (Éva Izsák)
6 credits, theoretical, optional, non-repeatable

FÖL/1/55 Air pollution – meteorology (Róbert Mészáros)
6 credits, theoretical, optional, non-repeatable

FÖL/1/56 Social GIS (Ákos Jakobi)
6 credits, practice, optional, non-repeatable

FÖL/1/59 Spaces on information society (Ákos Jakobi)
6 credits, theoretical, optional, non-repeatable

FÖL/1/62 Regional models (Ákos Jakobi)
6 credits, practice, optional, non-repeatable

FÖL/1/66 Investigation of climate-change with global model (Rita Pongrácz)
6 credits, theoretical, optional, non-repeatable

FÖL/1/68 Interpretation of fossile quaternary forms (Balázs Nagy)
6 credits, theoretical, optional, non-repeatable

FÖL/1/69 Theoretical and methodological questions in urban studies (Éva Izsák)

6 credits, theoretical, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/83 History of meteorological modelling 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

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

6 credits, practice, optional, non-repeatable

FÖL/1/91 GIS in socio-economic analysis (Ákos Jakobi)

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/94 The geographies of socialism and post-socialism (Gyuris Ferenc)

6 credits, theoretical, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

FÖL/1/96 Energy planning (Béla Munkácsi)

6 credits, theoretical, optional, non-repeatable

FÖL/1/97 Urban development, urban regeneration and the transformation of urban spaces in Hungary (Ferenc Gyuris)

6 credits, practice, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

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

6 credits, theoretical, optional, non-repeatable

FÖL/1/100 New tendencies in economic geography (Márton Czirfusz)

6 credits, theoretical, optional, non-repeatable

FÖL/1/104 New approaches to urban studies (Márton Berki)

6 credits, theory, optional, no repetition

FÖL/1/105 New approaches to cultural geography (Márton Berki)

6 credits, theory, optional, no repetition

FÖL/1/106 Geographies of big data and the information society (Ákos Jakobi)

6 credits, theory, optional, no repetition

Föl/1/110 Quaternary Geochronology (Ágnes Novothny, Zsófia Ruszkiczay-Rüdiger, Zoltán Kern)

6 credits, theory, optional, no repetition

FÖL/1/111 Weather and climate models (Hajnalka Breuer)

6 credits, theory, optional, no repetition

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

6 credits, theory, optional, no repetition

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

6 credits, theory, optional, no repetition

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

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/124 Historical settlement-geographical study of the structure of Transdanubian cities (Tibor Lenner)

6 credits, practice, optional, non-repeatable

FÖL/1/125 Pollen analysis (Enikő Magyar)

6 credits, practice, optional, non-repeatable

FÖL/1/126 Water, society, economy (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

FÖL/1/127 Geographies and geopolitics of knowledge (Ferenc Gyuris)

6 credits, theoretical, optional, non-repeatable

FÖL/1/128 Survival kit for scientific life (Csaba Torma)

6 credits, theoretical, optional, non-repeatable

FÖL/1/131 Health geography (Annamária Uzolli)

6 credits, theoretical, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/133 Spaces and places in marketing (András Kovács)

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/1/135 Climate change scenarios (Rita Pongrácz)

6 credits, theoretical, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

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

6 credits, practice, optional, non-repeatable

FÖL/RK-KV Study in another institution of higher education, credit transfer

Credit can be gained from study in and credit transfer from another institution of higher education (authorised to offer PhD education) with previous allowance of the Council of the Doctorate School and after acceptance of the achievement proved with document. Courses offered by programmes of the Doctoral School of Earth Sciences or other Doctoral Schools at Eötvös Loránd University can be taken and absolved, in case they are relevant for the PhD student's research topic.

Research module:

FÖL/K10 Steered research

10 credits, obligatory-optional, repeatable

FÖL/K15 Steered research

15 credits, obligatory-optional, repeatable

FÖL/K20 Steered research

20 credits, obligatory-optional, repeatable

FÖL/K25 Steered research

25 credits, kötelezően választható, ismételhető

FÖL/K30 Steered research – only after successful complex examination

30 credits, obligatory-optional, repeatable

FÖL/K/PUB6 Publications

6 credits, optional, repeatable

Publication in the research field of the planned PhD thesis, published in the semester, documented in the MTMT.

FÖL/BESZ1 Compulsory report, 1st year

1 credit, report, obligatory, non-repetable

FÖL/BESZ2 Compulsory report, 2nd year (in written form, requirement for the complex examination)

2 credits, obligatory, non-repetable

FÖL/BESZ3 Compulsory report, 3rd year

3 credits, report, obligatory, non-repetable

Teaching module (credits to be gained: 0 to 24):

FÖL/OKT Teaching activity

1 credit/1 hour per week, teaching, optional, can be repeated

II. GEOLOGY-GEOPHYSICS

Head of Programme: Prof. József Pálfy

Training Module, courses (36 compulsory credits from courses in first 4 semesters):

FÖL/2/3 Evolution of Ostracods (Emőke Mohr)

6 credits, theoretical, optional, non-repeatable

FÖL/2/9 Taxonomy of Foraminifers (Ágnes Görög)

6 credits, theoretical, optional, non-repeatable

FÖL/2/12 Cretaceous Palaeobiostratigraphy, Palaeo-ecology, Palaeoclimatology (Ágnes Görög)

6 credits, theoretical, optional, non-repeatable

FÖL/2/15 Methods of Biostratigraphy (Viktor Karádi-Kapiller)

6 credits, theoretical, optional, non-repeatable

FÖL/2/17 Basin Research (László Lenkey)

6 credits, theoretical, optional, non-repeatable

FÖL/2/22 Recent Geodynamics of the Pannonian Basin, Methodology, Results (László Fodor, László Csontos)

6 credits, theoretical, optional, non-repeatable

FÖL/2/23 Digital Terrain Models in Earth Sciences (Balázs Székely)

6 credits, theoretical, optional, non-repeatable

FÖL/2/28 Propagation of Waves in all form (Orsolya Ferencz)

6 credits, theoretical, optional, non-repeatable

FÖL/2/29 Study and Filtering of Whistlers (János Lichtenberger)

6 credits, theoretical, optional, non-repeatable

FÖL/2/30 Monitoring of the Upper Atmosphere by ULF and WLF signals (János Lichtenberger)

6 credits, theoretical, optional, non-repeatable

FÖL/2/35 X-ray Powder Diffraction Analysis (Tibor Németh)

6 credits, practice, optional, non-repeatable

FÖL/2/36 X-ray Powder Diffraction Phase Analysis I_II (Tibor Németh)

6 credits, theoretical, optional, non-repeatable

FÖL/2/38 Petrographical methods in the study of archaeological ceramics (György Szakmány)

6 credits, theoretical, optional, non-repeatable

FÖL/2/39 Petrographical and Geochemical Methods in Ceramics Research (György Szakmány)

6 credits, theoretical, optional, non-repeatable

FÖL/2/40 Provenance Studies in Archaeometry (György Szakmány)

6 credits, theoretical, optional, non-repeatable

FÖL/2/41 Provenance of Siliciclastics – Petrographical and Geochemical Methods (György Szakmány)

6 credits, theoretical, optional, non-repeatable

FÖL/2/42 Geochemistry of Weathering (György Szakmány)

6 credits, theoretical, optional, non-repeatable

FÖL/2/44 Introduction to Physical Volcanological Studies (Szabolcs Harangi)

6 credits, theoretical, optional, non-repeatable

FÖL/2/45 Geochemical modelling of igneous processes (Szabolcs Harangi)

6 credits, theoretical, optional, non-repeatable

FÖL/2/46 Neogene-Quaternary to Recent Volcanism of the Mediterranean (Szabolcs Harangi)

6 credits, theoretical, optional, non-repeatable

FÖL/2/49 Mineral chemical implications of micromineralogy (Sándor Józsa)

6 credits, theoretical, optional, non-repeatable

FÖL/2/51 Micromineralogy of clastic rocks (Sándor Józsa)

6 credits, theoretical, optional, non-repeatable

FÖL/2/53 Fluids in the Earth (Csaba Szabó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/54 Fluids in the Earth (Csaba Szabó)

6 credits, practice, optional, non-repeatable

FÖL/2/55 Basalts and their phase diagrams (Csaba Szabó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/56 Subducted lithospheric plates and the mantle-wedge (Csaba Szabó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/58 Hydrothermal ore-mineralization (Ferenc Molnár)

6 credits, theoretical, optional, non-repeatable

FÖL/2/59 Igneous and metamorphic ore-mineralization (Ferenc Molnár)

6 credits, theoretical, optional, non-repeatable

FÖL/2/60 Plate tectonics and ore formation (Ferenc Molnár)

6 credits, theoretical, optional, non-repeatable

FÖL/2/61 Fluid inclusion studies (Gabriella B. Kiss)

6 credits, theoretical, optional, non-repeatable

FÖL/2/68 Sedimentology and micropetrography of travertines (Andrea Mindszenty)

6 credits, theoretical, optional, non-repeatable

FÖL/2/69 Geology of Paleokarst (Andrea Mindszenty)

6 credits, theoretical, optional, non-repeatable

FÖL/2/70 Palaeopedology (Andrea Mindszenty)

6 credits, theoretical, optional, non-repeatable

FÖL/2/71 Seismic Sequence Stratigraphy (Orsolya Sztanó)

3 credits, theoretical, optional, non-repeatable

FÖL/2/77 Gravitationally controlled Groundwater Flow Systems (Judit Mádl-Szőnyi)

6 credits, theoretical, optional, non-repeatable

FÖL/2/78 Gravitationally controlled Groundwater Flow Systems (Judit Mádl-Szőnyi)

6 credits, practice, optional, non-repeatable

FÖL/2/81 Sensitivity and Vulnerability of Karst Systems (Judit Mádl-Szőnyi)
 3 credits, theoretical, optional, non-repeatable

FÖL/2/82 Sensitivity and Vulnerability of Karst Systems (Judit Mádl-Szőnyi)
 3 credits, practice, optional, non-repeatable

FÖL/2/83 Thermal waters and Geothermics (Judit Mádl-Szőnyi)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/85 Siliciclastic Petrography (Sándor Józsa)
 6 credits, practice, optional, non-repeatable

FÖL/2/88 Endemic evolution in long-lasting perennial lakes (Imre Magyar)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/91 Salt tectonics (László Csontos)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/92 Petrology of Ophiolites (Sándor Józsa)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/93 Key Events of the History of the Biosphere (József Pálffy)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/99 Laterites – Soils or Sedimentary Rocks (Andrea Mindszenty)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/101 Introduction to Environmental Geochemistry (Csaba Szabó)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/102 Metamorphic Petrology (György Szakmány)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/106 How to write scientific papers? (Balázs Székely, Gábor Timár)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/108 Carbonate-cycles and cyclostratigraphy (Haas János)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/109 Modern analytical methods in Geochemistry (Szabolcs Harangi)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/110 Advanced Igneous Petrology (Szabolcs Harangi)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/122 Mantle Convection – Selected Examples (Attila Galsa)
 6 credits, theoretical, optional, non-repeatable

FÖL/2/129 Data Analysis in Palaeontology (József Pálffy)

6 credits, theoretical, optional, non-repeatable

FÖL/2/133 Petroleum system analysis (László Csontos)

6 credits, practice, optional, non-repeatable

FÖL/2/134 Carbonate Sedimentology and Facies Analysis (János Haas)

6 credits, theoretical, optional, non-repeatable

FÖL/2/135 Clay Minerals in Geology (Tibor Németh)

6 credits, theoretical, optional, non-repeatable

FÖL/2/136 Raman-spectroscopy in Earth Sciences (Márta Berkesi)

6 credits, theoretical, optional, non-repeatable

FÖL/2/140 Structural elements of Hungary – Analysis and History (László Fodor)

6 credits, theoretical, optional, non-repeatable

FÖL/2/145 Dolomitization (János Haas)

6 credits, theoretical, optional, non-repeatable

FÖL/2/146 Introduction to Seismic Geomorphology (Orsolya Sztanó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/147 Nuclear Analytical Methods and their Application to Earth Sciences and Archaeometry-I.
(Katalin Gméling)

6 credits, theoretical, optional, non-repeatable

FÖL/2/148 Nuclear Analytical Methods and their Application to Earth Sciences and Archaeometry-II.
(Katalin Gméling)

6 credits, practice, optional, non-repeatable

FÖL/2/149 Fluid-Rock Interaction (Gabriella B. Kiss)

6 credits, theoretical, optional, non-repeatable

FÖL/2/150 Applied Geology Seminars (József Pálffy)

6 credits, theoretical, optional, repeatable

FÖL/2/151 Introduction to Organic Petrology (Mária Hámorné Vidó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/152 Organic Petrography – Basics and Applications (Mária Hámorné Vidó)

6 credits, theoretical, optional, non-repeatable

FÖL/2/153 Seminar on Basin Hydrodynamics (Brigitta Zentainé Czauner)

6 credits, theoretical, optional, non-repeatable

FÖL/2/157 Advanced geochronology (Réka Haranginé Lukács)

6 credits, theoretical, optional, non-repeatable

FÖL/2/158 Transmission electron microscopy practice (Viktória Kovácsné Kis)

6 credits, practice, optional, non-repeatable

FÖL/2/159 Mobile Earth (Miklós Kázmér)

6 credits, theory, optional, repeatable

FÖL/2/160 Planning instrumental analysis (Tamás Weiszbürg)

6 credits, practice, optional, no repetition

FÖL/2/164 Raw materials of Prehistoric polished stone tools in the Carpathian basin (György Szakmány)

6 credits, theory, optional, no repetition

FÖL/2/167 Introduction to Nuclear Explosion Monitoring Research (István Bondár)

6 credits, theory, optional, no repetition

FÖL/2/169 Vertebrate paleobiology (Attila Ősi)

6 credits, theory, optional, no repetition

FÖL/2/170 Seminar of the shape of the Earth (Gábor Timár)

6 credits, theory, optional, no repetition

FÖL/2/174 Karst bauxites (Andrea Mindszenty)

6 credits, theory, optional, no repetition

FÖL/2/175 Cosmochemistry (Stephen J Mojzsis)

6 credits, theory, optional, no repetition

FÖL/2/178 Challenges in hydrogeology in the 21st century – problems and solutions (Szilvia Szkolnikovics-Simon)

6 credits, theory, optional, no repetition

FÖL/2/180 Dynamics of the plasmasphere (Balázs Heilig)

6 credits, theory, optional, no repetition

FÖL/2/181 Practical applications of muography in geophysics (Gergő Hamar)

6 credits, theory, optional, no repetition

FÖL/2/182 Magmatic petrochronology: deciphering magmatic processes using geochemistry of phenocrysts and accessory minerals (Réka Lukács Haranginé)

6 credits, theory, optional, no repetition

FÖL/2/183 Inversion and Tomography (László Balázs)

6 credits, theory, optional, no repetition

FÖL/RK-KV Study in another institution of higher education, credit transfer

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Research module:

FÖL/K10 Steered research

10 credits, obligatory-optional, repeatable

FÖL/K15 Steered research

15 credits, obligatory-optional, repeatable

FÖL/K20 Steered research

20 credits, obligatory-optional, repeatable

FÖL/K25 Steered research

25 credits, obligatory-optional, repeatable

FÖL/K30 Steered research – Only after successful complex examination

30 credits, obligatory-optional, repeatable

FÖL/K/PUB6 Publications

6 credits, optional, repeatable

Publication in the research field of the planned PhD thesis, published in the semester, documented in the MTMT.

FÖL/BESZ1 Compulsory report, 1st year

1 credit, report, obligatory, non-repeatable

FÖL/BESZ2 Compulsory report, 2nd year (in written form, requirement for the complex examination)

2 credits, obligatory, non-repeatable

FÖL/BESZ3 Compulsory report, 3rd year

3 credits, report, obligatory, non-repeatable

Teaching module (credits to be gained: 0 to 24):

FÖL/OKT Teaching activity

1 credit/1 hour per week, teaching, optional, can be repeated

III. CARTOGRAPHY - GEOINFORMATICS

Head of Programme: Prof. László Zentai

Training Module, courses (36 compulsory credits from courses in first 4 semesters):

FÖL/3/1 Map design and editing (Mátyás Márton)

6 credits, theoretical, optional, non-repeatable

FÖL/3/2 Thematic cartography (Krisztina Irás)

6 credits, theoretical, optional, non-repeatable

FÖL/3/3 Map projections in GIS 1 (János Györffy, Krisztián Kerkovits)

6 credits, theoretical, optional, non-repeatable

FÖL/3/4 Research on the history of cartography (Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/5 Fundamentals of Cartographic Modelling (Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/6 Optimal projections of geographic maps 1 (János Györffy, Krisztián Kerkovits)

6 credits, theoretical, optional, non-repeatable

FÖL/3/7 Output-oriented digital cartography 1 (László Zentai)

6 credits, theoretical, optional, non-repeatable

FÖL/3/8 Digital filtering methods in GIS (István Elek)

6 credits, theoretical, optional, non-repeatable

FÖL/3/9 Map-based animations on the Web (Jesús Reyes)

6 credits, theoretical, optional, non-repeatable

FÖL/3/10 Writing of foreign geographical names (Gábor Gercsák)

6 credits, theoretical, optional, non-repeatable

FÖL/3/11 Geological mapping (Gáspár Albert)

6 credits, theoretical, optional, non-repeatable

FÖL/3/12 Chapters on Geographic names (András Dutkó)

6 credits, theoretical, optional, non-repeatable

FÖL/3/13 Hungarian topographic maps since the First Military Survey to 1950 (Annamária Jankó, László Zentai)

6 credits, theoretical, optional, non-repeatable

FÖL/3/14 Hungarian cartography 1528-1709 (Katalin Pilhál, Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/15 Application of map-based informatics in earth sciences (Gáspár Albert)

6 credits, theoretical, optional, non-repeatable

FÖL/3/16 Cartography in the History of science (Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/19 Satellite navigation systems (Béla Kovács)

6 credits, theoretical, optional, non-repeatable

FÖL/3/20 Cartographic paradigms (Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/21 Map-based animations on the web 2. (Jesús Reyes)

6 credits, theoretical, optional, non-repeatable

FÖL/3/22 Map design and editing II (Globes) (Mátyás Márton, Zsuzsanna Ungvári)

6 credits, theoretical, optional, non-repeatable

FÖL/3/23 Output-oriented digital cartography 2. (László Zentai)

6 credits, theoretical, optional, non-repeatable

FÖL/3/25 The art of map printing – development of printing technologies (Katalin Pilhál)

6 credits, theoretical, optional, non-repeatable

FÖL/3/26 Map projections in GIS 2 (János Györffy, Krisztián Kerkovits)

6 credits, theoretical, optional, non-repeatable

FÖL/3/27 Optimal projections of geographic maps 2 (János Györffy, Krisztián Kerkovits)

6 credits, theoretical, optional, non-repeatable

FÖL/3/28 The GIS background of 3D geological modelling (Gáspár Albert)

6 credits, theoretical, optional, non-repeatable

FÖL/3/29 New technologies in webcartography (Mátyás Gede)

6 credits, practice, optional, non-repeatable

FÖL/3/30 High precision GNSS measurements (Béla Kovács)

6 credits, practice, optional, non-repeatable

FÖL/3/33 Renaissance Cosmography and Cartography (Zsolt Győző Török)

6 credits, theoretical, optional, non-repeatable

FÖL/3/31 Cognitive cartography and geovisualization (Zsolt Győző Török)

6 credits, practice, optional, non-repeatable

FÖL/3/32 Thematic maps in GIS (Krisztina Irás)

6 credits, theoretical, optional, non-repeatable

FÖL/3/34 Cartographic Information Processing & School Cartography (Jesús Reyes)

6 credits, theory, optional, no repetition

FÖL/3/35 International overview of the science and practice of cartography 1. (László Zentai)

6 credits, theory, optional, no repetition

FÖL/3/36 International overview of the science and practice of cartography 2. (László Zentai)

6 credits, theory, optional, no repetition

FÖL/3/37 Hyperspectral imaging and field spectroscopy (András Jung)

6 credits, theory, optional, no repetition

FÖL/3/38 Drone based remote sensing in the Earth Science practice (János Mészáros)

6 credits, theory, optional, no repetition

FÖL/3/39 Science Communication in Geography and Geosciences (Zsolt Török)

6 credits, theory, optional, no repetition

FÖL/3/40 Pattern recognition and machine learning (Angela Lausch)

6 credits, theory, optional, no repetition

FÖL/3/41 Remote Sensing Sensors (András Jung, Zsófia Varga)

6 credits, practice, optional, no repetition

FÖL/RK-KV Study in another institution of higher education, credit transfer

Credit can be gained from study in and credit transfer from another institution of higher education (authorised to offer PhD education) with previous allowance of the Council of the Doctorate School and after acceptance of the achievement proved with document. Courses offered by programmes of the Doctoral School of Earth Sciences or other Doctoral Schools at Eötvös Loránd University can be taken and absolved, in case they are relevant for the PhD student's research topic.

Research module:

FÖL/K10 Steered research

10 credits, obligatory-optional, repeatable

FÖL/K15 Steered research

15 credits, obligatory-optional, repeatable

FÖL/K20 Steered research

20 credits, obligatory-optional, repeatable

FÖL/K25 Steered research

25 credits, obligatory-optional, repeatable

FÖL/K30 Steered research – Only after successful complex examination

30 credits, obligatory-optional, repeatable

FÖL/K/PUB6 Publications

6 credits, optional, repeatable

Publication in the research field of the planned PhD thesis, published in the semester, documented in the MTMT.

FÖL/BESZ1 Compulsory report, 1st year

1 credit, report, obligatory, non-repetable

FÖL/BESZ2 Compulsory report, 2nd year (in written form, requirement for the complex examination)

2 credits, obligatory, non-repetable

FÖL/BESZ3 Compulsory report, 3rd year

3 credits, report, obligatory, non-repetable

Teaching module (credits to be gained: 0 to 24):

FÖL/OKT Teaching activity

1 credit/1 hour per week, teaching, optional, can be repeated

Course free from the programmes (in studies module):

FÖL/KVE Scientific course in foreign language held by foreign guest lecturer

6 credits, theory, optional, can be repeated

REQUIREMENTS FOR AND CONTENT OF THE COMPLEX EXAMINATION

The applicant shall attach to the application for the complex examination a factual summary of the study and research achievements that can be approved in the doctorate training, and the applicant's research plan.

The applicant has to pass oral examination in two subjects from the list below (categorised by research programmes), which are related to the research topic. These are selected on basis of the PhD student's suggestion by the Council of the Doctoral School, which puts it forward to the Disciplinary Doctoral Council. Both subjects have the same weight in evaluation. Suggested duration of the complex examination, including both subjects, is 120 minutes.

The complex examination is evaluated and its theoretical part is taken into consideration in the final grade of the PhD according to the appendix for the Faculty of Science in the University Doctoral Regulation. The sum of the two grades gained for both subjects of the complex examination is expressed in percentage of the maximal value (10) and is converted to a four-grade scale.

SUBJECTS OF THE STUDY PART OF THE COMPLEX EXAMINATION

Geography:

- General physical geography
- General human geography
- Physical geography of Hungary and the Carpathian Basin
- Human geography of Hungary
- Regional physical geography
- Regional human geography
- Urban and regional development
- Environmental geography
- Regional science
- Urban geography
- History of geography
- Methods of teaching geography
- Ecology
- Landscape ecology
- Political geography
- Urban sociology
- Quaternary geography
- Soil science, soil geography
- GIS
- Methods of regional analysis

Meteorology:

- Theoretical meteorology
- Theoretical climatology
- Atmospheric physics
- Synoptic meteorology
- Meteorology of environmental protection
- Atmospheric chemistry
- Dynamic modelling
- Agrometeorology
- Numerical prediction
- Satellite meteorology
- Climatology
- Hydrometeorology
- Micrometeorology

Geology and geophysics:

- Petrology
- Geochemistry
- Mineralogy
- Ore geology
- Paleontology
- Paleobotany
- History of Earth
- Stratigraphy
- General geology
- Sedimentology
- Regional geology
- Geodynamics
- Structural Geology
- Environmental geology
- Hydrocarbon geology and basin analysis
- Hydrogeology
- Geomathematics and geostatistics
- Geophysics (Gravity, Physical Geodesy, Geomagnetism, Seismology, Geothermics)

- Mechanical structure, materials and dynamics of the Earth
- Applied geophysics (near-surface geophysics)
- Geophysical well-logging
- Geomagnetism and the physics of the Upper Atmosphere
- Geophysical methods in Geology

Cartography and geoinformatics:

- Map design and map-making
- Thematic cartography
- Computer assisted cartography
- Map projection
- Topography
- Geoinformatics
- History of cartography
- Topographic map systems
- Atlas cartography
- Toponymy
- Remote sensing

CRITERIA FOR THE 'THESIS PART' OF THE COMPLEX EXAMINATION

- Identify research fields and open questions, where you have achieved or plan to achieve new results. Give an overview about the current stand of research in the given domain.
- They have to summarise so-far results and the content of publications substantiating these.
- They have to present the research and publication plan for the next two years.

SYSTEM OF CONTROLLING ACHIEVEMENTS

The PhD student has to absolve at least 20 credits in each semester.

Study credits can be gained in the study and research phase before the complex examination.

Attending one course and absolving the examination it includes as well as fulfilling other criteria of accomplishment is worth of 3 credits. The accomplishment of a course is evaluated by its lecturer on a five-grade scale (1, 2, 3, 4, 5) and recorded in the Neptun system. The first two semesters are valid in case the PhD student gains at least 6 study credits in each semester. Maximum 50 % of the

study credits can be absolved by credit transfer.

Research activities are marked by the supervisor on a two-grade scale (satisfactory, fail).

The PhD student's publication activity can be evaluated in this category.

Research credits can be gained for a successful accomplishment of public reports, for maximum 6 credits in the study phase.

Research credits are certified by the head of PhD programme in the Neptun system.

Teaching activities are to be evaluated on a two-grade scale (satisfactory, fail). During the whole PhD training a maximum of 24 credits can be gained for teaching activities. Teaching activity embraces holding seminars, practices and field trips, and participation in laboratory teaching.