

Course title/Course Neptun ID: Advanced Regional Analysis Methods / FFGAZ304N	Credit value: 8
Professor in charge (name, position, academic degree): Zoltán Egri, Associate Professor, PhD, habil.	
Professor(s) involved in teaching, if any (name, position, academic degree): Zoltán Egri, Associate Professor, PhD, habil.	
Course category: <u>compulsory elective</u>	
Course type: lecture/seminar/practical course/consultation: 6/0/14/0, and total number of course sessions in the given semester: 24 course sessions	
Methods, (<i>specific</i>) tools, and characteristics applied to convey knowledge: Lecture and practical classes. The following software packages will be used during the course: GeoDa, GeoDaSpace, R, GWR 4.0, MGWR. Independent installation is required.	
Method of assessing knowledge (exam / practical course grade / other): exam	
Grading method(s) applied for assessing knowledge: Class attendance and participation: 15% Computer-based homework assignment: 25% Written assignment / term paper: 60%	
The course's placement in the curriculum (in which semester the course is taken): -	
Compulsory studies prior to the course (if any): -	
Course description: The aim of the course Advanced Regional Analysis Methods is to provide PhD students with in-depth knowledge of advanced methodological approaches used in regional research. A further objective is to familiarise students with modern methodological tools related to spatial inequalities and spatial econometrics, and to enable them to apply these methods in practice. The course focuses primarily on the practical issues of spatial dependence and spatial heterogeneity. The following topics and models are covered: - theoretical and practical issues of spatial autocorrelation analysis; - regression models in regional research: ordinary least squares regression (OLS), spatial error model (SEM), spatially lagged X model (SLX), spatial autoregressive / spatial lag model (SAR/SLM), spatial Durbin model (SDM), spatial Durbin error model (SDEM), Kelejian–Prucha model (SARAR/SAC), Manski model (GNS), geographically weighted regression (GWR, MGWR); - cluster analysis in geographical space.	
Course topics/semester syllabus: - Session 1: Fundamentals of spatial econometrics; theory and practice of spatial autocorrelation. - Session 2: Spatial econometric regression models in regional research I. - Session 3: Spatial econometric regression models in regional research II; cluster analysis in geographical space.	
A list of the 2-5 most relevant <u>compulsory</u> literature (notes, textbooks) with bibliographic information (author, title, publication details, page numbers, ISBN):	

- Anselin, L. – Rey, S. J. (2014): Modern Spatial Econometrics in Practice. A Guide to GeoDa, GeoDaSpace and PySAL. GeoDa Press LLC, Chicago.
- LeSage, J. P. – Pace, R. K. (2009): Introduction to Spatial Econometrics Statistics. Chapman and Hall. <https://doi.org/10.1201/9781420064254>
- Pebesma, E. – Bivand, R. (2023): Spatial Data Science: With Applications in R (1st ed.). Chapman and Hall/CRC. <https://doi.org/10.1201/9780429459016>
- Nemes Nagy, J. (2009): Terek, helyek, régiók. A regionális tudomány alapjai. Akadémiai Kiadó, Budapest.
- Egri, Z. (2024/2025): Területi konvergenciafolyamatok az Európai Unióban: a térbeli hatások szerepe. Térstatisztikai elemzések. Agro-Assistance Kft., Csongrád. ISBN: 9786150220918 and 9786150237480

A list of the 2-5 most relevant *recommended* literature (notes, textbooks) with bibliographic information (author, title, publication details, page numbers, ISBN):

- Annoni, P. – De Dominicis, L. – Khabirpour (2019): Location matters: A spatial econometric analysis of regional resilience in the European Union. Growth and Change, 50(3), 824–855. <https://doi.org/10.1111/grow.12311>
- Floch, J.-M. – Le Saout, R. (2018): Spatial econometrics – common models. In: Loonis, V. – De Bellefon (eds.): Handbook of Spatial Analysis: Theory and Application with R. INSEE – Eurostat.
- Elhorst, J. P. (2014): Spatial Econometrics: From Cross-Sectional Data to Spatial Panels. Springer. <https://doi.org/10.1007/978-3-642-40340-8>
- Elhorst, J. P. (2021): Spatial panel models and common factors. In: Fischer, M. – Nijkamp, P. (eds.): Handbook of Regional Science (2nd ed., pp. 2141–2159). Springer. https://doi.org/10.1007/978-3-662-60723-7_86

Professional competencies, elements of competence, and skills to which the course typically and substantially contributes (knowledge, ability, attitude, autonomy, and responsibility):

The course Advanced Regional Analysis Methods contributes substantially to enabling PhD students to understand and apply, at research level, the advanced methodological toolkit of regional science and spatial econometrics.

- Knowledge: The course deepens students' research-level understanding of spatial econometric models, spatial autocorrelation analysis, spatial regression methods and cluster analysis in geographical space. Students become familiar with the logic, application conditions, interpretation possibilities and limitations of the main models. Through the software used in the course, they acquire practical skills in spatial data management, analysis and visualisation.
- Skills: The course develops students' independent research, analytical and modelling competences. Students become able to analyse regional and territorial processes quantitatively, select appropriate methods, build and run spatial econometric models, and interpret their results critically. The course also supports comparative and critical evaluation, as well as the formulation of economically, socially and territorially relevant conclusions based on empirical findings. It contributes to students' ability to prepare reproducible and methodologically sound analyses in independent research projects.
- Attitude: The course strengthens methodological rigour, critical thinking and the complex interpretation of spatial processes. Students become more open to the

use of modern quantitative and spatial econometric methods, and more sensitive to the economic, social and development policy relevance of territorial differences, inequalities and spatial relationships. The course also promotes professional commitment to the methodological soundness, verifiability and reproducibility of empirical research.

- Autonomy and responsibility: The course supports students in independently planning and carrying out advanced regional and spatial econometric analyses. It develops responsible method selection, data management, model interpretation and presentation of results. Students become able to recognise the scientific and practical limitations of the applied models and to formulate an independent, well-founded professional position on research and practical issues in regional science, economic analysis and territorial development.