



Subject card

Subject name and code	SPATIAL ECONOMETRICS, PG_00070491						
Field of study	Economic Analytics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Statistics and Econometrics -> Faculty of Management and Economics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Michał Pietrzak					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM		
	Number of study hours	45	3.0	52.0	100		
Subject objectives	preparing students to develop innovative solutions to socio-economic problems in a spatial context using spatial econometrics methods, based on knowledge of advanced data analysis techniques and sources of economic information.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W02] understands the significance and interrelationships of key components describing economic processes, drawing on in-depth knowledge aligned with major developmental trends in scientific disciplines related to the field of economic analytics.		has knowledge and understanding of spatial econometrics methods and reliable sources of spatial data in the context of analyzing complex socio-economic phenomena.		[SW1] Assessment of factual knowledge		
	[K7_U05] collaborates with others in team projects, effectively fulfilling both leadership and team member roles to achieve established goals.		is able to effectively collaborate in a team when conducting spatial econometric analyses, acting as a leader or team member, contributing to the interpretation of model results and working towards shared research objectives.		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_K01] is ready to critically evaluate his/her knowledge in economic analytics and seek expert opinions when facing difficulties in solving a problem independently.		is ready to critically and responsibly assess the results of spatial econometric analyses, including data quality and model adequacy, and to seek expert input in situations requiring deeper analytical insight.		[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> 1. Introduction to spatial data analysis 2. Classification and visualization of spatial data 3. Visualization of spatial data 4. Basics of clustering and classification in spatial research 5. Concentration and specialization in spatial economic analysis (location quotients, Lorenz curve, Gini index, regional specialization indices) 6. Measures and statistical tests in exploratory spatial data analysis (heterogeneity and spatial autocorrelation) 7. Spatial weights matrices and testing global and local spatial autocorrelation 8. Single-equation spatial regression models and types of spatial interactions in econometric models 9. Construction of spatial models with different interaction types, estimation and verification (ML), spatial model selection procedures 10. Spatial panel models construction 11. Spatial panel model selection procedures 12. Multivariate spatial models seemingly unrelated regressions (SUR) 13. Spatial models with simultaneous equations <hr/> <p>Course content – laboratory</p> <ol style="list-style-type: none"> 1. Introduction to working with spatial data (reference to lecture: Introduction to spatial data analysis) 2. Importing, preparing, and managing spatial datasets (reference to lecture: Classification and visualization of spatial data) 3. Visualization of spatial data (thematic maps, box maps, etc.) (reference to lecture: Visualization of spatial data) 4. Spatial clustering and classification techniques (reference to lecture: Basics of clustering and classification in spatial research) 5. Analysis of spatial concentration and inequality (reference to lecture: Concentration and specialization in spatial economic analysis) 6. Exploratory spatial data analysis (ESDA) (reference to lecture: Measures and statistical tests in exploratory spatial data analysis) 7. Construction and standardization of spatial weights matrices (reference to lecture: Spatial weights matrices and testing spatial autocorrelation) 8. Testing global and local spatial autocorrelation (reference to lecture: Spatial weights matrices and testing spatial autocorrelation) 9. Estimation of basic spatial regression models (reference to lecture: Single-equation spatial regression models) 10. Model comparison and spatial model selection (reference to lecture: Construction and selection of spatial models) 11. Introduction to spatial panel data models (reference to lecture: Spatial panel models) 12. Advanced models (SUR, simultaneous equations) (reference to lecture: Multivariate and simultaneous spatial models) 														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Quizzes</td> <td>0.0%</td> <td>10.0%</td> </tr> <tr> <td>Project and midterm test in a computer lab</td> <td>60.0%</td> <td>40.0%</td> </tr> <tr> <td>Exam</td> <td>60.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Quizzes	0.0%	10.0%	Project and midterm test in a computer lab	60.0%	40.0%	Exam	60.0%	50.0%
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Recommended reading	<p>Basic literature</p> <ol style="list-style-type: none"> 1. Bivand, R. S., Pebesma, E., & Gómez-Rubio, V. (2013). <i>Applied spatial data analysis with R</i> (2nd ed.). New York, NY: Springer. 2. Baltagi, B. H. (2014). <i>Econometric analysis of panel data</i> (5th ed.). Chichester: Wiley. 3. Anselin, L. (1988). <i>Spatial econometrics: Methods and models</i>. Dordrecht: Kluwer Academic Publishers. 4. LeSage, J. P., & Pace, R. K. (2009). <i>Introduction to spatial econometrics</i>. Boca Raton, FL: CRC Press. 5. Kelejian, H. H., & Piras, G. (2017). <i>Spatial econometrics</i>. London: Academic Press. 6. Arbia, G. (2006). <i>Spatial econometrics: Statistical foundations and applications to regional convergence</i>. Berlin: Springer. 7. Elhorst, J. P. (2014). <i>Spatial econometrics: From cross-sectional data to spatial panels</i>. Berlin: Springer. 8. Anselin, L., Florax, R. J. G. M., & Rey, S. J. (Eds.). (2004). <i>Advances in spatial econometrics</i>. Berlin: Springer. 9. Arbia, G., & Baltagi, B. H. (Eds.). (2009). <i>Spatial econometrics: Methods and applications</i>. Heidelberg: Physica-Verlag. 														

	Supplementary literature	<ol style="list-style-type: none"> 1. Fingleton, B. (2003). <i>Advanced spatial econometrics</i>. Berlin: Springer. 2. Cliff, A. D., & Ord, J. K. (1981). <i>Spatial processes: Models and applications</i>. London: Pion. 3. Cressie, N. (1993). <i>Statistics for spatial data</i>. New York, NY: Wiley. 4. Haining, R. (2003). <i>Spatial data analysis: Theory and practice</i>. Cambridge: Cambridge University Press. 5. Fotheringham, A. S., Brunsdon, C., & Charlton, M. (2002). <i>Geographically weighted regression</i>. Chichester: Wiley. 6. Banerjee, S., Carlin, B. P., & Gelfand, A. E. (2014). <i>Hierarchical modeling and analysis for spatial data</i> (2nd ed.). Boca Raton, FL: CRC Press. 7. Wooldridge, J. M. (2010). <i>Econometric analysis of cross section and panel data</i> (2nd ed.). Cambridge, MA: MIT Press.
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> • Based on spatial data from the Central Statistical Office (GUS), conduct an analysis of the location and concentration of employment by sectors and voivodeships for a selected year • Visualize the spatial distribution of GDP per capita in Poland and interpret the obtained results • Calculate location quotients (LQ) for a selected economic sector and identify regions specializing in this activity • Construct the Lorenz curve and calculate the Gini index for the distribution of income or employment at the regional level • Conduct an exploratory spatial data analysis (ESDA) for a selected economic variable and assess the presence of spatial autocorrelation • Construct a spatial weights matrix (e.g., based on contiguity or distance) and compare results for different specifications • Calculate the global Morans I statistic and interpret the result in the context of spatial dependence • Determine local spatial autocorrelation statistics (LISA) and identify spatial clusters and outliers • Estimate a spatial regression model (SAR or SEM) for a selected economic problem and compare the results with a classical OLS model • Select the best spatial model based on diagnostic tests and information criteria (AIC, BIC) and justify the choice • Based on panel data for voivodeships (e.g., GDP, unemployment), estimate a spatial panel model and compare it with a classical panel model 	
Practical activities within the subject	Not applicable	

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