

Subject card

Subject name and code	Spatial Quantitative Methods, PG_00204582						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's 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	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		6.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Department of Econometrics -> Faculty of Management -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Anna Zamojska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	0.0	0.0	75
	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	75		4.0		71.0	150
Subject objectives	To develop students' knowledge and skills in spatial data analysis, identification of spatial relationships, and the application of spatial statistics, geostatistics, spatial econometrics, and GIS tools to socio-economic problems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[liEMU2_W05] Possesses advanced knowledge and understanding of informatics, statistics, and econometrics techniques and tools used to acquire, process, or visualise data to aid in decision-making and verify research hypotheses	Has advanced knowledge and understanding of methods for acquiring, processing, visualizing, and analysing spatial data using GIS tools, spatial statistics, and spatial econometrics.	[SW4] test/exam - oral or written
	[liEMU2_W02] Comprehends advanced theoretical and practical concepts in econometrics, informatics, or statistics, which are essential for a deeper understanding of economic and social phenomena	Has advanced knowledge and understanding of the possibilities and limitations of applying spatial analysis, GIS, and spatial models to solve economic, social, and environmental problems.	[SW4] test/exam - oral or written
	[liEMU2_U02] Can use conventional or innovative statistics, econometrics or informatics tools to analyze economic and social phenomena	Is able to independently design and conduct a spatial analysis of a selected socio-economic problem, including data acquisition, visualization, exploratory analysis, and interpretation of results.	[SU5] implementation of a problem task
	[liEMU2_U04] Can choose, develop, and analyze traditional or innovative models of complex economic and social phenomena to make informed decisions	Is able to apply methods of spatial statistics, geostatistics, and spatial econometrics to support decision-making processes and identify spatial determinants of socio-economic phenomena.	[SU2] presentation/project/paper/report [SU5] implementation of a problem task
	[liEMU2_U03] Is able to obtain and verify data from properly selected sources and to collect, process, and visualize it using modern econometrics, informatics or statistics tools	Is able to acquire, integrate, evaluate the quality of, and prepare spatial data from various sources for analytical and research purposes.	[SU5] implementation of a problem task
Subject contents	[liEMU2_W06] Possesses a structured understanding of the processes, methods, and tools necessary for the design, creation, development, and provision of suitable conditions for informatics, econometrics or statistics tools	Has knowledge and understanding of the theoretical foundations of modelling spatial processes, including spatial autocorrelation, spatial dependence, geostatistics, and spatial regression applied in socio-economic analyses.	[SW4] test/exam - oral or written
	Introduction to Spatial Analysis: basic concepts and definitions used in spatial analysis, characteristics and typology of spatial data, spatial interactions, neighbourhood and distance, the role of spatial analysis in economic, social, and environmental research. Sources, Quality, and Preparation of Spatial Data: sources of spatial and georeferenced information, Geographic Information Systems (GIS), quality, completeness and uncertainty of spatial data, sample representativeness, issues related to the aggregation of spatial data. Spatial Data Visualization and Presentation: qualitative and quantitative methods of visualizing spatial phenomena and processes, thematic cartography, principles of map design, the use of GIS software for data visualization, interactive data presentation and spatial dashboards. Classification and Clustering of Spatial Data: methods of spatial data classification, clustering and regionalization of spatial units, cluster analysis, identification of similar areas and spatial patterns. Exploratory Spatial Data Analysis: fundamental concepts of spatial statistics, spatial heterogeneity, spatial autocorrelation, exploratory spatial data analysis (ESDA), global and local measures of spatial dependence, identification of clusters and areas of spatial concentration. Geostatistics and Point Pattern Analysis: basic concepts of geostatistics, analysis of spatial point data, semivariograms, spatial interpolation methods, kriging, and applications of geostatistics in economic and environmental studies. Analysis of Spatial Structures and Processes: spatial concentration and specialization, measures of spatial concentration and inequality, regional structure analysis, gravity, potential and spatial diffusion models, selected topics in New Economic Geography. Modelling Spatial Dependence: operationalization of spatial relationships using spatial weight matrices, construction of spatial weight matrices based on different neighbourhood and distance concepts, fundamentals of spatial econometrics, spatial regression models (SAR, SEM, SDM), interpretation of spatial effects and applications of spatial models in socio-economic analysis.		
	Prerequisites and co-requisites		
	Knowledge of basic statistics, econometrics, and data analysis methods. Ability to work with data and interpret quantitative analysis results.		
	Assessment methods and criteria		
	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	Written exam	51.0%	75.0%
	Project with presentation	51.0%	25.0%
Basic literature		- Kopczewska K.(red.), <i>Przestrzenne metody ilościowe w R: statystyka, ekonometria, uczenie maszynowe, analiza danych</i>, CeDeWu, Warszawa 2020 - Suchecka J. (red.), <i>Statystyka przestrzenna: metody analiz struktur przestrzennych</i>, C.H. Beck, Warszawa 2014 - Suchecki B. (red), <i>Ekonometria przestrzenna. Metody i modele analizy danych przestrzennych</i>, C.H. Beck, Warszawa 2010	

	Supplementary literature	1. Kopczewska K. (red.), <i>Applied Spatial Statistics and Econometrics. Data Analysis in R</i>, Routledge, London 2026 2. Łaskiewicz E. (red), <i>Ekonometria przestrzenna 3. Modele wielopoziomowe, teoria i zastosowania</i>, C.H. Beck, Warszawa 2016 3. Suhecki B. (red), <i>Ekonometria przestrzenna 2. Modele zaawansowane</i>, C.H. Beck, Warszawa 2012
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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