Course name: Geographic Information Systems: Site selection

ECTS	*4*
Course status	*basic, obligatory*
Course final assessment /evaluation of outcomes	*graded credit*
Prerequisite	*Sound ability to use and understand Geographic Information Systems*

Main field of study: Land Management, Land Surveying, Environmental Sciences, Economics

Educational profile	*General academic*
Code of studies and education level	*Master*
Semester of studies	*Winter*
Language of instruction	*English*

Course offered by:

Name of faculty offering the course	*Faculty of Environment Engineering and Land Surveying*
Name of department offering the course	*Department of Land Management and Landscape Architecture*
Course coordinator	*dr inż. Barbara Czesak, dr inż. Renata Różycka-Czas*

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands:			
SSG_W1	theories of location and basic models and methods of location analysis		
SSG_W2	the most important concepts of graph theory, knows and understands the principles of determining Voronoi diagrams, knows the assumptions of Delaunay triangulation; understands the assumptions of Euler's cycle and Hamilton's cycle, knows the assumptions of Fleury's algorithm		
SSG_W3	methods and algorithms of network analysis, the most important applications of network analysis, main pathfinding problems, including the Chinese postman problem and the traveling salesman problem		
SSG_W4	basic methods of multi-criteria analysis and its stages, knows and understands the basic sources of uncertainty in the spatial multi-criteria analysis model in Geographic Information Systems		
SKILLS – student is able to:			
SSG_U1	select appropriate tools and apply selected network analysis algorithms to achieve a given goal		
SSG_U2	generate criteria maps, determine the weights of criteria, perform multi-criteria analysis to support decision-making regarding the location of an object, take into account quantitative and qualitative criteria		
SSG_U3	assess the usefulness and feasibility of using available spatial data sets and public statistics for multi-criteria decision support using GIS		
SOCIAL COMPETENCIES – student is ready to:			

SSG_K1	work in a team, participate in substantive discussions. Is aware of the usefulness of location analyses in practical applications		
SSG_K2	responsibly perform one's own work, as well as be responsible for jointly performed group tasks		

Teaching contents

Lectures:	15 hours
Topics	Theories of location, location analyses - types and applications Elements of graph theory, Delaunay triangulation; Voronoi diagram Finding the shortest paths in graphs; accessibility analyses; isochrones, equidistants, service areas, distance matrices (source-target); Chinese postman problem, traveling salesman problem, Huff's relative gravity model Elements of multi-criteria analysis - theoretical foundations; definitions, applications Selected methods of multi-criteria analysis (overlaying, WLC, OWA); basic sources of uncertainty in the spatial multi-criteria analysis model
Accomplished learning outcomes	*SSG_W1, SSG_W2, SSG_W3, SSG_W4, SSG_K1, SSG_K2*
Means of verification, rules and criteria of assessment	To pass with a grade of 3.0, it is required to achieve a minimum of 50% of the points from the lecture assessment. Higher grades are calculated proportionally to the score. The assessment can be conducted in the form of a mixed test (multiple and single choice questions, closed and open questions) or in the form of open questions. The weight of this grade in the final grade: 50%.
Classes:	30 hours
Topics	Determining service areas of objects - network analysis in QGIS (Delaunay triangulation, Voronoi diagram, QNEAT 3, ORS Tools, OD-matrix, Iso-areas) Gravity models; application of Huff's model Criteria and tools for location assessment; identifying potential spatial conflicts, strengths, and weaknesses of locations and areas; barriers Application of selected multi-criteria analysis methods - overlaying, WLC, OWA, AHP
Accomplished learning outcomes	*SSG_U1, SSG_U2, SSG_U3, SSG_K1, SSG_K2*
Means of verification, rules and criteria of assessment	To pass, it is required to positively complete partial project exercises. The grade is the average of the partial grades. The weight of this grade in the final grade: 50%.
Field practicals:	… hours
Topics	
Accomplished learning outcomes	
Means of verification, rules and criteria of assessment	

References:

Basic	*1. Gérard Cliquet, Jérôme Baray, 2020, Location-Based Marketing: Geomarketing and Geolocation* *2. Richard L. Church; Alan T. Murray, 2008, Business Site Selection, Location Analysis and GIS* *3. Vinod Yadav, Milind Kumar Sharma, 2016, Multi-Criteria Decision Making Approaches for Supplier Selection*
Supplementary	*1. Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. W., 2008 Geographic Information Systems and Science*

Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	…	ECTS **
Area of academic study: T – technical sciences	4	ECTS**

Structure of student activity

Contact hours	47	hrs.	ECTS**
Including: lectures	15	hrs.	
classes and seminars	30	hrs.	
consultations	1	hrs.	
participation in research		hrs.	
obligatory field trips		hrs.	
participation in examination	1	hrs.	
e-learning		hrs.	ECTS**
student own work	53	hrs.	ECTS**

*Areas of academic study in the fields of: A – the arts; H – humanities; M – medical, sport and health sciences; N – natural sciences; P – biological sciences; R – agricultural, forestry and veterinary sciences; S – social studies; T – engineering and technology

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25–30 hours of classes