Advanced Spatial Analysis

Educational subject description sheet

Basic information

Field of study Joint Bachelor in Sustainability	**Education cycle** 2025/26
Speciality Social Sciences & Humanities	**Realization year** 2027/28
Organizational unit Faculty of Law and Administration	**Subject code** UJ.WPAJBSSSHS.810.16611.25
Study level first cycle (joint degree programme)	**Lecture languages** english
Study form full-time degree programme	**Subject related to scientific research** Yes
Education profile General academic	**Disciplines** Earth and Environmental Sciences
Mandatory elective	**ISCED classification** 0532 Earth sciences
	USOS code

Subject coordinator	Piotr Szwedo
Lecturer	Ross Purves, Franziska Komossa

Period Semester 5	**Examination** graded credit **Activities and hours** Lecture: 24 Classes: 21	**Number of ECTS points** 5.0

Goals

C1	This course consists of lectures and practicals. The aim of the lectures is to explore spatial data and its exploitation in more detail from the perspective of Geographic Information Science. The practicals aim at illustrating theory and developing problem-solving skills.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the relationship between Geographic Information Systems and spatial databases and are aware of the growing importance of internet applications and GIS.	JBS_K1_W04, JBS_K1_W06, JBS_K1_W07	credit with grade, project
Skills – Student can:			
U1	define and discuss spatial data quality and uncertainty with respect to a range of spatial data.	JBS_K1_U02, JBS_K1_U03	credit with grade, project
U2	explain how specific spatial algorithms work in detail. For given problems, students can discuss and compare the influence of alternative algorithms and implementations on results.	JBS_K1_U03, JBS_K1_U04	credit with grade, project
Social competences – Student is ready for:			
K1	to propose, implement and justify approaches to spatial analysis for complex problems.	JBS_K1_K02, JBS_K1_K05	credit with grade, project

Calculation of ECTS points

Activity form	Activity hours*
Lecture	24
Classes	21
preparation for classes	5
preparation of a project	70
preparation of a multimedia presentation	5
report preparation	10
legal texts analysis	15

Student workload	Hours	ECTS
	150	5.0

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes
1.	Lecture: Course introduction & Database basics Practical: Getting started with ArcGIS Pro & Model Builder	W1, U1, U2

No.	Course content	Subject's learning outcomes
2.	Lecture: Spatial interpolation Practical: Spatial interpolation I	W1, U1, U2
3.	Lecture: Data quality and simple error models Practical: Spatial interpolation II	W1, U1, U2
4.	Lecture: Working with terrain models Practical: Hydrological analysis I	W1, U1, U2
5.	Lecture: Project background, Open spatial data & input from Canton Basel-Stadt Practical: Hydrological analysis II	W1, U1, U2
6.	Lecture: Viewshed analysis Practical: Viewshed analysis I	W1, U1, U2
7.	Lecture: Error propagation and modelling in spatial analysis Practical: Viewshed analysis II	W1, U1, U2
8.	Lecture: Spatial decision support systems & input ARE Practical: Project work	W1, U1, U2, K1
9.	Lecture: Public Participation GIS Practical: Project work	W1, U1, U2, K1
10.	Lecture: Crowdsourced Geographic Information Practical: Project work	W1, U1, U2, K1
11.	Lecture: GIS and the Internet Practical: Project work	W1, U1, U2, K1
12.	Lecture: Dashboards Practical: Project work	W1, U1, U2, K1
13.	Lecture/Practical: Project presentations	W1, U1, U2, K1

Course advanced

Teaching methods :

text analysis, discussion, practicals

Activities	Examination methods	Credit conditions
Lecture	credit with grade, project	Presentation of the group project, active participation in the lectures and practical classes. The grade for the course is based on the group project.
Classes	credit with grade, project	Presentation of the group project, active participation in the lectures and practical classes. The grade for the course is based on the group project.

Entry requirements

None

Literature

Obligatory

1. Burrough, Peter A., Rachael A. McDonnell, and Christopher D. Lloyd. Principles of geographical information systems. Oxford University Press, USA, 2015. Open spatial data sources appropriate for student projects.

Effects

Code	Content
JBS_K1_K02	The graduate can demonstrate considerable entrepreneurial initiative, autonomy, and readiness to act in complex and changing environments, especially in the context of supporting, undertaking, and co-organising activities beneficial for a sustainable society.
JBS_K1_K05	The graduate can defend the importance of scientific data and methods as a basis for decision-making.
JBS_K1_U02	The graduate can present and report knowledge, methodologies, ideas, problems and solutions, clearly and comprehensively, in different forms destined for different audiences – including discussions and debates which require defending a substantiated opinion, as well as conversations in a foreign language at the CEFR B2 level.
JBS_K1_U03	The graduate can apply adequate methods and tools, including selected IT tools, to solve problems related to data collection, analysis, and management in the context of sustainability.
JBS_K1_U04	The graduate can plan and effectuate simple sustainability-related projects under supervision and in the context of personal lifelong learning, both individually and in a team, using appropriate transversal skills and taking shared responsibility for the outcome.
JBS_K1_W04	The graduate can identify sustainability-related problems specific to selected cultural, geographical, and political contexts.
JBS_K1_W06	The graduate can describe interconnections between various aspects of sustainability and identify their significance in the context of natural and social sciences, with a special focus on disciplines included in the selected specialisation track (law and politics; chemistry and physics; chemistry and biology; economics and geography; economics, management and engineering; humanities).
JBS_K1_W07	The graduate can apply the theory and methodology of disciplines included in the selected specialisation track to sustainability-related problems, taking into consideration practical limitations such as protection of intellectual property.