University of Gdańsk

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Innovative spatial management: a glimpse into the future, PG_00191818 | | | | | | |
| Field of study | Spatial Management | | | | | | |
| Date of commencement of studies | October 2026 | | Academic year of realisation of subject | 2026/2027 | | | |
| Education level | Master's studies | | Subject group | Obligatory subject group in the field of study<br>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 | 1.0 | | | |
| Learning profile | academic | | Assessment form | credit | | | |
| Conducting unit | | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr Hanna Obracht-Prondzyńska | | | | |
| | Teachers | | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20 |
| | 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 | 20 | | 0.0 | | 5.0 | 25 |
| Subject objectives | The aim of the course is to prepare students to operate in the rapidly evolving field of spatial planning and management by introducing them to future-oriented trends, technologies, and tools used in planning, managing, and analysing space. The course focuses on the role of artificial intelligence, big data analytics, digital city models, and digital tools that support more sustainable, resilient, and inclusive territorial development. An important component of the course is the development of practical competencies related to data analysis, experimentation with emerging technologies, and designing innovative solutions to address future spatial challenges. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [GPMU2_K02] is ready to solve cognitive and practical problems in the field of economic and social geography based on acquired knowledge in cooperation with various entities, including representatives of local government units | The student is prepared to collaboratively use digital tools, artificial intelligence, and big data analytics to address practical challenges in spatial planning and management in cooperation with representatives of the public, private, and social sectors. | [SK2] presentation/project/paper/ report<br>[SK6] demonstration of practical skills |
| [GPMU2_U06] can organise and lead a debate among diverse audiences regarding spatial conflicts, with particular emphasis on environmental conflicts | The student is able to communicate the results of data-driven spatial analyses and present proposals for innovative technological solutions addressing contemporary spatial conflicts and challenges to diverse stakeholder groups. | [SU2] presentation/project/paper/ report<br>[SU5] implementation of a problem task |
| [GPMU2_W06] identyfies problems and theories in spatial management, taking into account complex dependencies and trends of changes in the natural environment; understands their theoretical and practical significance | The student understands contemporary models for developing innovative services, products, and technological solutions applied in spatial planning and management, and recognizes the importance of responsible implementation of new technologies with regard to social, environmental, and ethical considerations. | [SW2] presentation/project/paper/ report<br>[SW5] implementation of a problem task |
| [GPMU2_W07] knows basic principles for creating and developing forms of individual entrepreneurship that make use of knowledge in the field of spatial management and corporate social responsibility, with particular emphasis on responsibility for environmental impact | The student understands contemporary models for developing innovative services, products, and technological solutions used in spatial planning and management, and recognizes the importance of the responsible implementation of new technologies with consideration for social, environmental, and ethical aspects. | [SW2] presentation/project/paper/ report<br>[SW5] implementation of a problem task |

## Subject contents

- Digital transformation of spatial planning and management emerging trends and future directions of the sector
- Digital twins for cities and their applications in spatial planning, infrastructure management, and development scenario modelling
- Artificial intelligence in spatial analysis and decision-making processes
- Big data in spatial planning and management data sources, analytical opportunities, and ethical limitations
- Digital tools supporting urban climate adaptation, mobility development, investment processes, and inclusive space design
- Digital participation tools and applications engaging residents in urban processes
- Immersive technologies and spatial prototyping (e.g. VR/AR, 3D printing, drones, spatial modelling)
- The role of digital competencies and basic programming skills in the future of spatial planning professions
- Case studies of innovative implementations developed by cities, technology companies, and the public sector
- Practical application of selected digital tools in analysing real-world spatial challenges

## Prerequisites and co-requisites

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Analysis of a selected big dataset presented in the form of a presentation | 51.0% | 100.0% |

<table>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Batty, M. (2013). The New Science of Cities. Cambridge, MA: MIT Press.<br>2. Kitchin, R. (2014). The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences. London: Sage.<br>3. Townsend, A. M. (2013). Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia. New York: W.W. Norton & Company.<br>4. Goodspeed, R. (2020). Scenario Planning for Cities and Regions: Managing and Envisioning Uncertain Futures. Cambridge, MA: Lincoln Institute of Land Policy.<br>5. Clark, J. (2020). Uneven Innovation: The Work of Smart Cities. New York: Columbia University Press.</td></tr>
<tr><td>Supplementary literature</td><td>• Ketzler, B., Naserentin, V., Latino, F., et al. (2020). Digital Twins for Cities: A State of the Art Review. Built Environment, 46(4), 547573.<br>• Weil, C., Porto de Albuquerque, J., et al. (2023). Urban Digital Twin Challenges: A Systematic Review and Research Agenda. Sustainable Cities and Society, 99, 104926.<br>• Yessef, M., et al. (2025). Digital Twin Technology in Smart Cities: A Step Toward Smarter Urban Management. Smart Cities, 8(2).<br>• Zhang, F., Salazar Miranda, A., Duarte, F., Vale, L., Chen, M., Liu, Y., & Ratti, C. (2023). Urban Visual Intelligence: Studying Cities with AI and Street-Level Imagery. Cities, 134, 104174.<br>• Xu, H., Omitaomu, F., Sabri, S., Zlatanova, S., Li, X., & Song, Y. (2024). Leveraging Generative AI for Urban Digital Twins: A Scoping Review. Computers, Environment and Urban Systems.<br>• Bibri, S. E. (2021). Data-Driven Smart Sustainable Cities of the Future: An Evidence Synthesis Approach to a Comprehensive State-of-the-Art Literature Review. Sustainable Cities and Society, 64, 102559.<br>• Kitchin, R., & Lauriault, T. P. (2015). Small Data in the Era of Big Data. GeoJournal, 80(4), 463475.<br>• Vanolo, A. (2014). Smartmentality: The Smart City as Disciplinary Strategy. Urban Studies, 51(5), 883898.<br>• Cardullo, P., & Kitchin, R. (2019). Being a Citizen in the Smart City: Up and Down the Scaffold of Smart Citizen Participation. GeoJournal, 84, 113.<br>• Korada, L. (2021). Unlocking Urban Futures: The Role of Big Data Analytics and AI in Urban Planning A Systematic Literature Review and Bibliometric Analysis. Migration Letters, 18(6), 873885.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Example topics / questions / assignments<br><br>• How are digital twins transforming urban planning, infrastructure management, and public decision-making?<br>• Can artificial intelligence improve spatial planning processes? Opportunities and limitations of AI in urban governance.<br>• How can big data support evidence-based planning and policy-making?<br>• What are the ethical risks associated with algorithmic decision-making in cities?<br>• How can digital tools support climate adaptation and resilience planning?<br>• In what ways can technology improve urban mobility systems and transport planning?<br>• How do digital platforms reshape housing markets, tourism, and urban economies?<br>• Can digital participation tools strengthen citizen engagement in planning processes?<br>• What skills will future spatial planning professionals need in the era of AI and automation?<br>• How are cities using drones, VR/AR, and 3D printing in urban planning practice?<br><br>Example practical assignments<br><br>• Testing selected digital tools used in spatial planning and urban management<br>• Analysing selected large datasets related to urban development challenges<br>• Identifying spatial patterns based on mobility, housing, safety, or environmental datasets<br>• Preparing recommendations based on data-driven analysis<br>• Presenting team-based solutions to real-world spatial challenges</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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