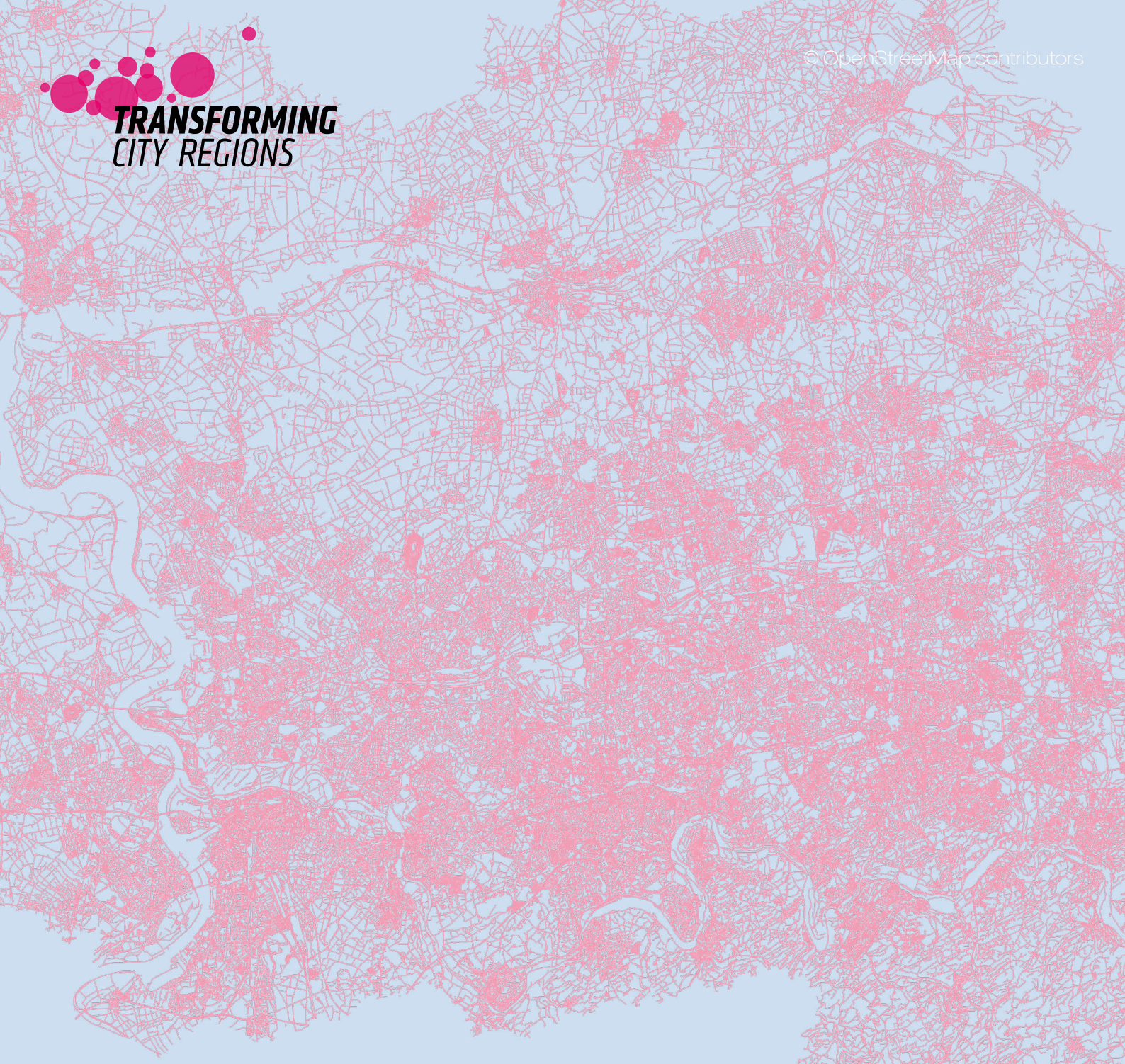
TRANSFORMING
CITY REGIONS



European Master of Science

Transforming City Regions

Semester Handbook

Summer Semester 2025

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Preamble

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Dear Reader,

The English taught master programme “TRANSFORMING CITY REGIONS” at RWTH Aachen University was launched in the winter semester 2019/20. The high demand from students from Germany, Europe and, last but not least, the whole world shows that the content orientation of the degree programme towards international transformation processes was well-chosen. Students from the disciplines of architecture, urban planning, landscape planning, civil engineering, geography, and cultural studies have been very successful in the past semesters in dealing with concepts and strategies in urban design and in neighbourhood, city and regional development.

This has involved an intensive examination of the major challenges of transformation – urbanisation in the form of reurbanisation and suburbanisation as well as the reshaping of entire regions, such as the lignite mining region in the Rhineland. Above all, there is agreement that transformation processes can only be successfully mastered if the right instruments, concepts and strategies are applied. And many of these challenges and questions for the future can no longer be answered by looking at the local context, but require an international exchange of experience, as is taking place within the framework of the English taught master programme “TRANSFORMING CITY REGIONS” (TCR).

In times of globalisation and increasing networking, knowledge in dealing with international transformation processes is more important than ever. It not only opens up new career prospects for graduates, but also qualifies them in every respect for the future challenges in the broad field of urban and regional planning.

The teaching results presented in the following show how students have dealt with transformation processes at the various spatial scales and levels - from the neighbourhood, to the city, to the region - and how the spatial level can be successfully linked with the strategic level.

I hope you enjoy exploring these projects.

Prof. Christa Reicher
Head of the international TCR programme


Copenhagen
5 hour distance
Hamburg
2 hours distance
Amsterdam
1 hour distance
Berlin
London
Rotterdam
Eindhoven
Brussels
Aachen
Cologne
Frankfurt
Luxembourg
Paris
Munich
Zurich
Milan
Rome

People

The international teaching and research network Transforming City Regions is based at RWTH Aachen University and led by Prof. Christa Reicher, head of the Chair and Institute of Urban Design at the Faculty of Architecture. The network includes partners from academia and practice and aims to advance the level of knowledge of regional transformation processes in post-industrial areas within the framework of an international comparative action.

Coordination

Univ.-Prof. Dipl.-Ing. Christa Reicher

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Foto: Michel-Kitenge

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Teaching Core

Prof. Dr. Jakob Beetz

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Module(s): Territorial analysis and digital tools

j.beetz@caad.arch.rwth-aachen.de

Prof. Dr. Stefan Böschen

Chair of Society and Technology (SoTec)
Module(s): Changing Societies and Economies

stefan.boeschen@humtec.rwth-aachen.de

Foto: Sirtoli

Prof. em. Dr.-Ing. Andrea Haase

Chair of Urban Design and Institute for Urban Design and European Urbanism
Module(s): Urban Transformation I & II, Elective courses

a.haase@raumstruktur.de

Prof. Dr. Agnes Förster

Chair for Planning Theory (PT)
Module(s): Multiple scales of urban planning and design, Elective courses, Impromptu courses

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Prof. Dr. Tobias Kuhnimhof

Chair and Institute of Urban and Transport Planning (ISB)
Module(s): Research Module in urban and regional transformation

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Prof. Dr. Frank Lohrberg

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Visiting Prof. Dr. Jan-Peter Voß

Chair of Society and Technology (SoTec)
Module(s): Changing Societies and Economie

Jan-peter.voss@humtec.rwth-aachen.de

Foto: Volker Kuntzsch

Transforming City Regions

is a European master programme that integrates many disciplines in order to educate professionals being able to respond to the challenges of evolving European territories of different scales with respect for the environment, using the technical excellence and a solution-oriented approach, understanding the economic efficiency and respecting social needs.

General Information

Transforming City Regions (TCR) is a unique, multidisciplinary master programme with a strong focus on the European dimension of territorial development. The degree programme is taught in English and is designed to respond to the environmental, social, technological, and economic challenges which European cities and regions are facing. TCR takes a technically advanced and solution-oriented approach so that you can understand economic efficiency and identify societal needs.

The TCR programme is one of the few programmes that have been newly designed at RWTH Aachen University to respond to European territorial challenges. The special focus is on a project and design-oriented education that equips graduates not only with up-to-date and solid knowledge, but also with the tools and methods to help them tackle the problems of Europe's changing cities and regions. Despite its clear multidisciplinary orientation, the engineering and design-oriented profile of the graduates is deeply rooted in the tradition of the Faculty of Architecture at RWTH Aachen University and also gives the programme a strong identity.

Key Facts

Degree:
Master of Science RWTH

Start of Studies:
Winter Semester

Standard Period of Studies:
4 semesters

ECTS Credits:
120

Language:
English

Check out our website!

Course registration procedure

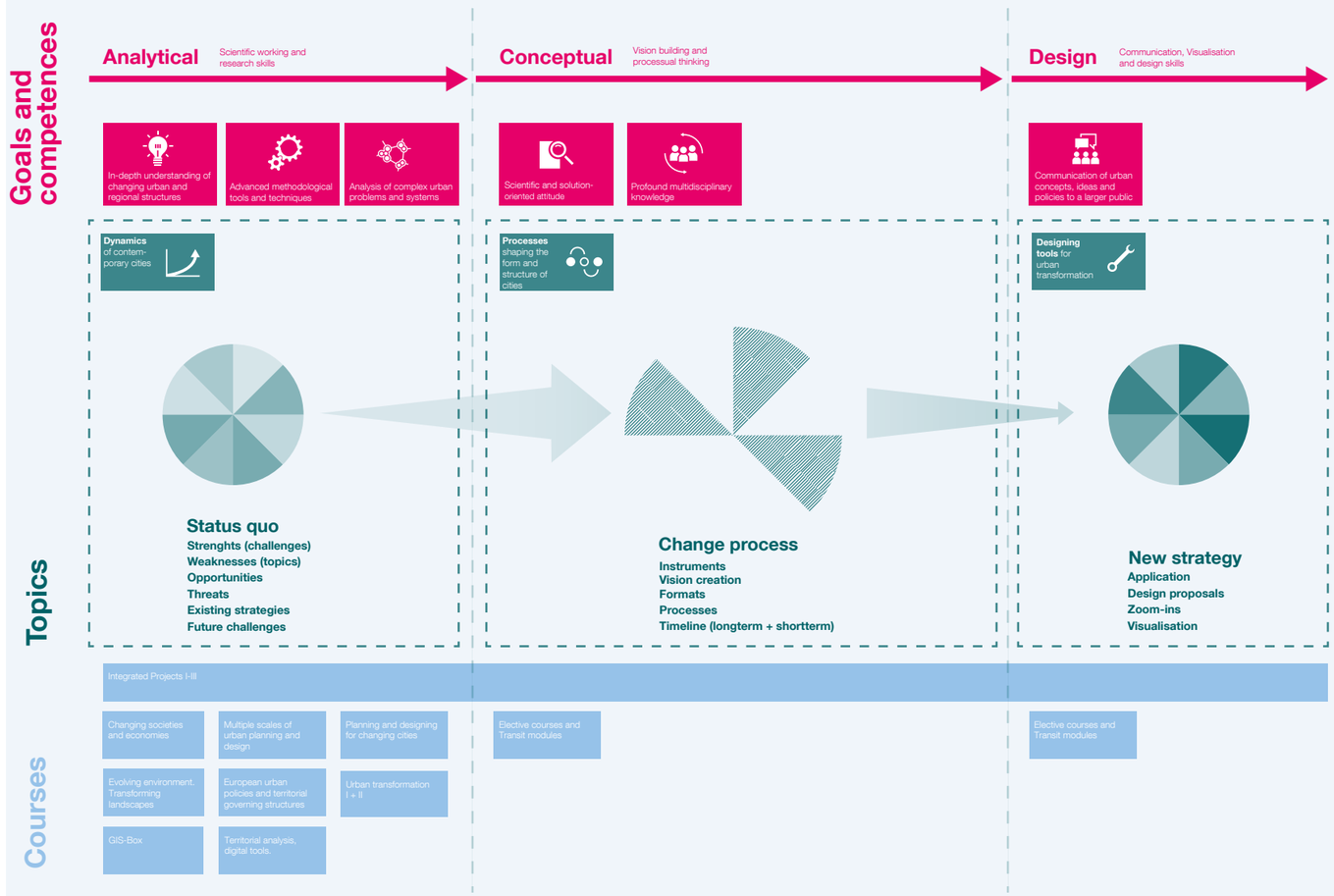
Important semester dates

Programme Structure

The degree programme is structured in 4 semesters, with the last semester being dedicated to the Master thesis. The core of the master programme is formed by three major integrated project works during the first three semester. The increasing territorial complexity and issues with different structural and content-related priorities and the link with the foundations of other disciplines should lead to integrative and conceptual thinking.

These projects are characterised by a broad spectrum of methodological, procedural, morphological, landscape architectural, ecological, legal, and economic aspects. The remaining ECTS are available through compulsory modules, elective courses, research modules, field trips/impromptu courses and transit courses.

If you have a degree in urban design, urban planning, urban studies, spatial planning, regional planning, landscape architecture, architecture, transport planning, environmental engineering, urban geography, urban ecology or urban governance, this degree programme is particularly suitable for you.



Curriculum Framework

The programme consists of a wide range of courses covering current topics of urban planning and design. Within four semesters the students learn theoretical backgrounds and methodological skills. The knowledge is applied in three different integrated projects, as well as the master thesis. There are several elective courses to be chosen from within the faculty and the further pool of RWTH wide courses.

Core Courses

Elective Compulsory Courses

Elective Courses

Semester 1
Winter Semester

Urban Transformation I
2SWS / 3CP

Planning & Design for Changing Cities
2SWS / 3CP

Evolving Environment. Transforming Landscapes
2SWS / 3CP

Impromptu Courses + Field Trip
2SWS / 6CP

Integrated Project I: Transforming Urban Structure
4SWS / 15CP

Semester 2
Summer Semester

Urban Transformation II
2SWS / 3CP

Changing Societies & Economies
2SWS / 3CP

Territorial Analysis, Digital Tools
2SWS / 3CP

European Urban Policies & Territorial Governing Structures
2SWS / 3CP

Research Module in Urban and Regional Transformation*
2SWS / 6CP

Integrated Project II: Evolution of Functional Urban Areas
4SWS / 15CP

Semester 3
Winter Semester

Multiple Scales of Urban Planning & Design
2SWS / 3CP

Elective Courses
2SWS / 3CP

Elective Courses
2SWS / 3CP

Transit
0SWS / 3CP

Integrated Project III: Networked Urban Systems in Europe
4SWS / 15CP

Semester 4
Summer Semester

Master Thesis Project Work & Presentation of the Thesis
0,5SWS / 30CP

Compulsory Modules

The compulsory modules or core courses focus on dynamics of contemporary cities, the processes shaping the form and structure of cities, and designing tools for urban transformation. The knowledge provided by a multidisciplinary teaching staff provides knowledge, tools, and methodologies to respond to challenges of evolving European territories while being aware of different spatial aspects such as social, economic, and ecological ones.

Urban Transformation II
Multiple Scales of Urban Planning

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Prof. em. Dr.-Ing. Andrea Haase

Lecture dates
Thursdays, 11.00-13.00, SG301

Examination Date
17.07.2025

Examination Format
Group-exercise + oral presentation

3 ECTS Points 30

2 SWS 12

Course Content
The course builds up on the analysis of phenomena/ processes of urban growth, having been introduced in general and related to the urban structure of the students' hometowns by individual exercises in Winter Semester 2024/2025. It leads this understanding of socio-culturally specific processes to guiding the conditions of urban transformation for "healthy environments" in Germany by group-exercises. It introduces structural as well as legal conditions and rules for guiding urban transformation in Europe/ Germany. General knowledge from weekly inputs by lectures is to be applied locally with reference to a "local culture", case of Aachen. Herewith, an evaluation of ongoing processes of urban transformation is set up by a multi-scale approach to a location/ group to be selected. Small-spatial processes of the land-market and opportunities for counterbalancing any damages to "healthy living and working conditions" preventatively are searched for. Starting point: Basic parameters for guiding urban transformation are long-term values of qualifying the environment relative to any appropriate perspectives for implementing a circular economy. The lectures enfold thematic fields informing about criteria for guiding the quality of urban space under the formal and informal rules of the German Federal Planning System, which will be contrasted to the centralized British Planning System. They introduce the importance of the municipality in Germany as the smallest and most powerful level of the system, partially responsive for guiding tasks of the local/ regional economies with respect to tangible and intangible heritage. The tools of the planning system are to be tested in their appropriateness.

Learning Objectives
The exercise offers – per group/ location - a mezzo-model for an approach to evaluating local conditions of urban transformation for counterbalancing preventatively potential damages of the land-market in the city of Aachen/ region. It links different levels of scale for the different locations of urban space in the municipality – considering them as systemic parts of the overall urban structure and its integration into the region. The task is about understanding ongoing urban changes and setting up long-term visions for turning processes of exploiting resources into conditions for a "circular economy". It considers interventions of planning for the trialogue of "territory/ space/ arena for activities" by back-casting from a long-term vision via mid- and short-term scenarios and their options of implementation. Binding resources of nature (brooks and hot sources) as well as of local culture (education, trade, arts and crafts) to area/ morphology are to be considered as opportunities for intervention.

Reading Recommendations
Alexander, St. Pascucci, F. Charnley (eds.)(2023), Handbook of the Circular Economy, Transitions and Transformation, De Gruyter

Hillier, B. (1996): Space is the machine. Space Syntax, London.

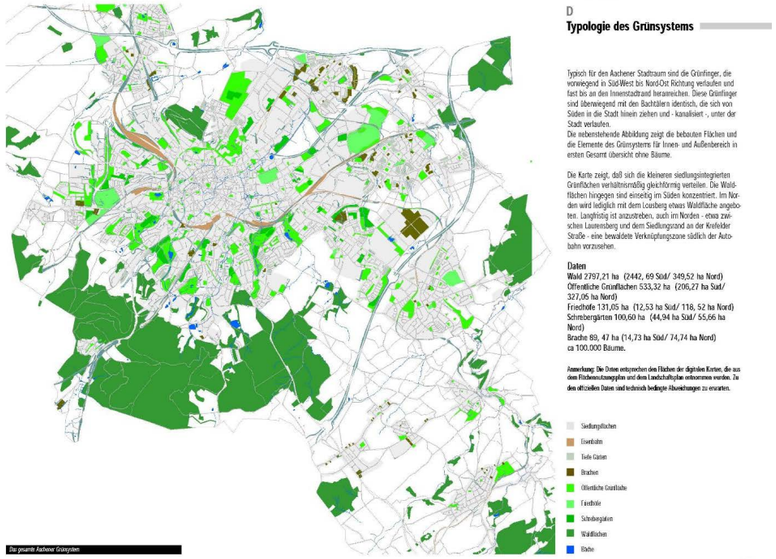
Lefebvre, H. (1991): The production of space. Blackwell, Oxford. Lynch, K. (1960): The Image of the City. MIT Press, Cambridge (MA)

Haase, A., (2005): Topographies of values: Urban transformation in East-Germany, in: Urban Design International, 10. Jg., S. 115–136

Haase, A. (2004): Culture of Establishing and Using Space. In: Baukultur. Stadtkultur, Lebenskultur,

8. Jg, Heft 2, S. 21–34

Hall, P. (2000): The centenary of modern planning. In: Freestone, R. (Hrsg.): Urban Planning in a changing World. Spon, London, S. 29–35



© ILS, 1997, Das Aachener Grünsystem – in: Aachen in Schichten. Grün. Raum. Struktur

European Urban Policies & Territorial Governing Structures

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Dr. Fabio Bayro Kaiser

Dates
Lecture Block: Understanding
09.04.2025- Introduction I: European urban governance, institutions and frameworks
15.04.2025, Introduction II: European urban policies and funding mechanisms
Workshop Block: Mapping
30.04.2025- Demographic change
07.05.2025- Economic transformation
14.05.2025- Climate & energy transition
20.05.2025- Digitalisation and artificial intelligence
Debate Block: Reflecting
28.05.2025- Multilevel governance challenges and implementation gaps
04.06.2025- Urban futures and policy innovation

Examination Date
02.07.2025, 09.00-12.00

Examination Format
Written essay and oral presentation

Course Capacity: 40 Students

3 ECTS Points 30

2 SWS 2

Course Content

This course provides a critical understanding of European urban policy and its role in shaping cities and regions in response to global challenges. Participants will examine EU institutions, frameworks and key policy documents as well as global frameworks. Through a structured approach of understanding, mapping and reflecting, participants will analyse governance models, evaluate policy implementation in areas such as demography, economy, climate, energy, digitalisation and artificial intelligence, and critically assess their effectiveness.

Learning Objectives

Participants will explore the political dimensions of design and planning, evaluating governance models and their impact on urban transformation. Through case studies, policy analysis and interactive exercises, students will develop research, analytical and debating skills, enabling them to evaluate policy frameworks, critique governance structures and propose recommendations.

Reading Recommendations

European Commission (2016) Urban Agenda for the EU – Pact of Amsterdam. Available at: https://ec.europa.eu/regional_policy/sources/policy/themes/urban-development/agenda/pact-of-amsterdam.pdf
European Commission (2020) Leipzig Charter on Sustainable European Cities (Updated Version). Available at: https://ec.europa.eu/regional_policy/en/information/publications/brochures/2020/new-leipzig-charter-the-transformative-power-of-cities-for-the-common-good
UN-Habitat (2016) New Urban Agenda. Available at: https://habitat3.org/the-new-urban-agenda/
OECD (2020) Regions and Cities at a Glance 2020. Paris: OECD Publishing. Available at: https://doi.org/10.1787/959d5ba0-en
European Commission (2019) The European Green Deal. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
Eurostat (2024) Urban-rural Europe - demographic developments in rural regions and areas Luxembourg: Publications Office of the European Union. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Urban-rural_Europe_-_demographic_developments_in_rural_regions_and_areas#:~:text=On%201%20January%202023%2C%20more,a%20city%3B%20see%20Figure%202.
McKinsey Global Institute (2021) The Future of Work in Europe: Automation, AI, and Regional Resilience. Available at: https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-in-europe
European Commission (2021) Digital Decade Strategy: AI, Open Data, and Smart Cities. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

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Territorial Analysis, Digital Tools

Module Responsible
Chair of Design Computation (Caad)
Prof. Dr. Jakob Beetz

Teaching Staff
Noemi Kremer

Dates
10.04.2025, 9.00-10.00, online
08.05.2025, 9.00-10.00, online
05.06.2025, 9.00-10.00, online
26.06.2025, 9.00-10.00, online
13.07.2025, 9:00-10.00, online
24.07.2025, 9.00-12.00, online

Examination Date
07.08.2025, 9.00-10.00

Examination Format
Dynexite online exam (Take home exam)

3 ECTS Points 30

2 SWS 2

Course Content

Meaningful maps are based on a solid foundation of information. But what does this look like? Data formats such as CSV, JSON or GeoPackage help to store information in a structured way, but how is it best processed? OpenStreetMap offers a wealth of geoinformation, but how can this information be accessed and easily processed?
Beyond applications like QGIS (GIS Basics), information can be customized, adapted, visualized and analysed by using Python programming. In this course, we show the basics of object-oriented modelling as well as different data formats. We also deal with data transformation and scripting, data modelling and work out basic algorithms of spatial analysis. We will query OSM for information and create simple analysis maps and graphs. The aim is to understand the structure and composition of spatial data in order to be able to process and analyse it.
The course includes video readings for theoretical content and Jupyter Notebooks for practical application of data processing.
Students submit a small programming task as a Jupyter Notebook for exam admission. The course is completed by passing an online written exam (Dynexite). For support, 3 Q&A appointments and one exam preparation appointment are offered during the semester, participation is voluntary.

Learning Objectives

Skills and goals: Analysis and modelling of data, basic understanding of data structures generic / GIS-specific, basic Python programming skills, data transformation and linking, data examination and investigation, data visualization, querying OSM data.

Changing Societies & Economies

Socio-Technical Change and Transformation Dynamics

Module Responsible
Chair of Society and Technology (SoTec)
Prof. Dr. Stefan Böschen

Teaching Staff
Visiting Prof. Dr. Jan-Peter Voß

Dates
Bi-weekly (every second week)
08.04.2025, 14.30-16.00, online
22.04.2025, 14.30-16.00, online
06.05.2025, 14.30-16.00, online
20.05.2025, 14.30-16.00, online
03.06.2025, 14.30-16.00, online
17.06.2025, 14.30-16.00, online
01.07.2025, 14.30-16.00, online
15.07.2025, 14.30-16.00, online

Examination Date
22.08.2025

Examination Format
Essay (2000 words)

3 ECTS Points 30

2 SWS 12

Course Content

This seminar offers a selection of theoretical concepts to describe processes of socio-technical change. What are specific dynamics of transformation resulting from the interplay of socio-cultural and techno-material dimensions of collective orders of life (in cities, regions)? How does this influence strategies for shaping such transformations, how does it challenge established approaches in urban design and planning? Strategies of collective experimentation receive attention against this background, and students are encouraged to explore how this may relate with their own urban planning and design projects.

Learning Objectives

The main objective is to bring students in contact with conceptual perspectives capturing complex relations of society and technology (or culture and materiality). A selection of sociological approaches is offered for consideration, also in relation with concrete design and planning projects that students are concerned with. Students are asked to articulate the questions that are opened up by acknowledging both the socio-cultural constitution of technology and the techno-material constitution of society as well as complex patterns of co-evolution resulting from it. Strategies of collective real-world experimentation are introduced as an orientation to cope with and shape complex dynamics of transformation and students are asked to consider in how far they already are practiced in their planning and design projects or how they could fruitfully be integrated as a way to practically acknowledge and engage with complex dynamics of socio-technical change.

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Elective Compulsory Modules

The increasing territorial complexity and issues with different structural and content-related priorities and the link with the foundations of other disciplines should lead to integrative and conceptual thinking. The elective compulsory courses are characterised by a broad spectrum of methodological, procedural, morphological, landscape architectural, ecological, legal, and economic aspects.

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Integrated Project II

AgriPark – Space for life and production

Module Responsible
Chair and Institute of Landscape Architecture
Prof. Dr. Frank Lohrberg (LA)

Teaching Staff
M.Sc. Nathalie Pszola (LA)

Dates
Mondays, 13.00-17.00
Starting date: 07.04.2025

Examination Date
14.07.2025

Examination Format
Oral presentation

Course Capacity: 5-16 Students

15 ECTS Points 30

4 SWS 12

Course Content

An agricultural park is an innovative and multifunctional concept that manages the spatial and conceptual balancing act between agriculture, nature conservation and recreation. It is a landscaped place of production and direct marketing, but also a place for green leisure activities that is open to all. The planning and design of such a park requires a deep understanding of the ecological, social and economic interrelationships as well as a clear vision of how these elements can be harmoniously integrated.

The aim of this design task is to develop a comprehensive concept for an agricultural park for various locations in the Cologne area, which not only promotes agricultural production, but also serves as an educational and leisure centre and makes a positive contribution to sustainable development. Both traditional and modern agricultural methods are to be taken into account in order to create a diverse and resilient agricultural landscape. The challenge is to integrate the different needs and interests of farmers, visitors and conservationists into a balanced and future-orientated design.

The task is carried out in groups of two.

Learning Objectives

In the course, students are taught the interaction between residential areas and landscape or agricultural areas. The students deal with the pressing issue of land use conflicts in metropolitan areas and develop concrete answers for the multiple use of areas close to settlements.

Other key topics during the semester:
- Understanding of regional network structures in the Cologne area (topic areas: agriculture, ecology and society)
- Insights into future-oriented agricultural cultivation structures (e.g. agroforestry, biointensive cultivation...)
- Evaluation of best practice case studies of implemented agricultural parks in other European countries.
- Landscape architectural design on different planning scales.


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Integrated Project II
Regional Strategy East Belgium

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Nicole Maurer
Lucyna Zalas
Marc Maurer
Hewi Tabea
Liyuan Ma

Dates
Mondays, 13.00-17.00 (NRB)
Starting date: 07.04.2025

Examination Date
28.07.2025

Examination Format
Oral presentation, posters and report

Course Capacity: 16 Students

15 ECTS Points 30

4 SWS 12

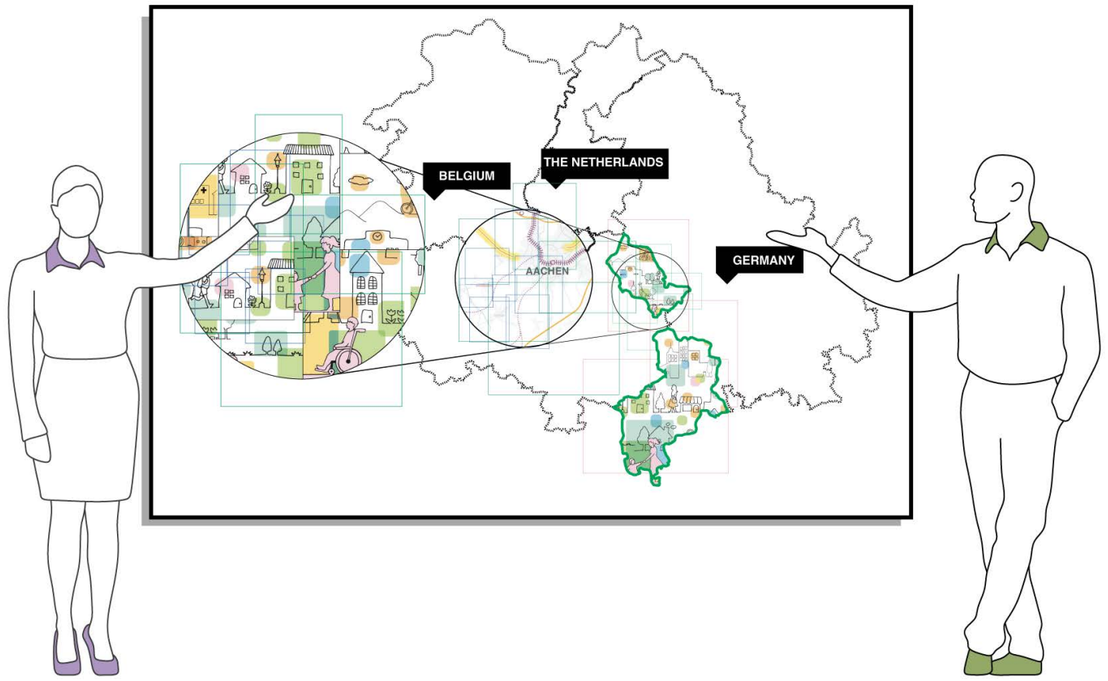
Course Content
This integrated project course focuses on the future of East Belgium in response to global challenges such as climate change, digital transformation, and demographic shifts. Aligning with regional mission statements, students will explore strategies for sustainable spatial development. Key topics include regional connectivity, intergenerational participation, economic and labor market transformation, and climate resilience.

Through spatial and socio-economic analysis and scenario-based design, students will propose integrated solutions aligned with the regional development strategy's nine key objectives. Special attention will be given to the spatial implications of the evolving labor market, particularly how work and living can be restructured to create more inclusive and accessible environments. The studio will also examine the concept of a "15-minute region," ensuring mobility and accessibility for all.

The course includes lectures, field trips, and workshops, complemented by group work and individual research. Students will develop spatial strategies that balance economic viability with social and environmental sustainability. The final output will be a set of visionary proposals contributing to the broader discourse on regional planning and resilience.

Learning Objectives
By the end of the course, students will:
- Understand the spatial and socio-economic challenges facing East Belgium, particularly in the context of climate change, demographic shifts, and digitalization.
- Analyse and interpret the regional mission statement Ostbelgien leben 2040 as a planning framework.
- Explore the relationship between work, living environments, and transportation planning.
- Develop spatial strategies that integrate economic resilience, climate adaptation, and mobility solutions.
- Consider stakeholders' and local communities' interests to understand diverse perspectives and needs.
- Use scenario-based design approaches to generate visionary yet practical planning proposals.
- Strengthen interdisciplinary thinking by working at the intersection of urban planning, transportation, and regional economics.
- Visualise, present and communicate complex planning concepts effectively through maps, visualizations, and policy recommendations.

This course equips students with the skills and knowledge to contribute to future-oriented regional planning in East Belgium and beyond.



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Integrated Project III

Tackling Energy Poverty through Placemaking in Hoensbroek, Heerlen

Module Responsible

Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff

Dr. ir. Ceren Sezer
Alper Al

Dates

Mondays, 13.00-17.00

Examination Format

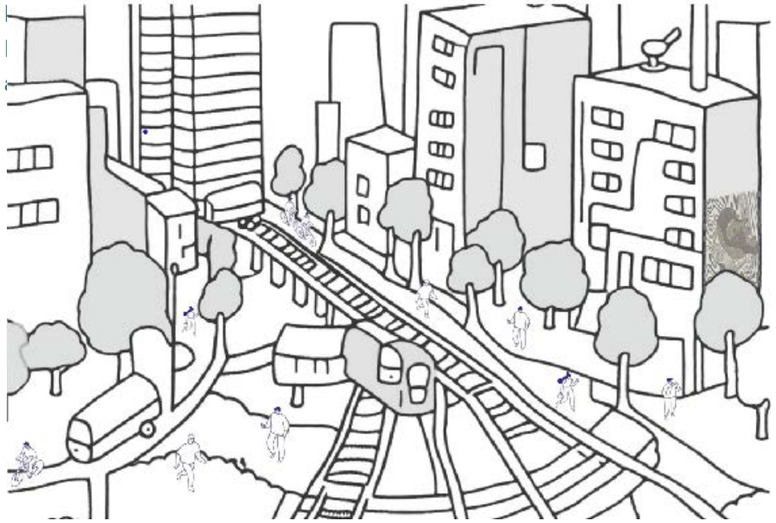
Oral presentation, poster presentation and report

15 ECTS Points 30

4 SWS 12

Course Content

This Integrated Project III explores placemaking as a strategy to mitigate energy poverty in Hoensbroek, a former mining district in Heerlen. Hoensbroek is located Northwest of Heerlen with approximately 20,000 inhabitants. Mining activities were stopped in 1965, and the city has faced unemployment and urban vacant spaces. Students will develop integrated spatial solutions, focusing on affordable energy, public space revitalization, sustainable mobility, and climate-responsive design. Through mapping, data analysis, and community participation, they will propose site-specific urban interventions. The project aligns with Heerlen's Structural Vision 2035, promoting flexible, sustainable, and participatory urban strategies for post-industrial regeneration.



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Research Module

Mobility Research and Transport Modeling

Module Responsible

Chair and Institute of Urban and Transport Planning

Prof. Dr. Tobias Kuhnimhof (ISB)

6 ECTS Points 30

2 SWS 12

Teaching Staff

Prof. Dr.-Ing. Tobias Kuhnimhof

Zixuan Chen

Dates

07.04.2025 (H11, Claßenstr. 11)
14.04.2025 (H11, Claßenstr. 11)
28.04.2025 (H11, Claßenstr. 11)
05.05.2025 (H11, Claßenstr. 11)
12.05.2025 (H11, Claßenstr. 11)
19.05.2025 (H11, Claßenstr. 11)
26.05.2025 (H11, Claßenstr. 11)
02.06.2025 (H11, Claßenstr. 11)
16.06.2025 (H11, Claßenstr. 11)
23.06.2025 (H11, Claßenstr. 11)
30.06.2025 (H11, Claßenstr. 11)
07.07.2025 (H11, Claßenstr. 11)

Examination Date

05.09.2025

Examination Format

Written exam

Course Content

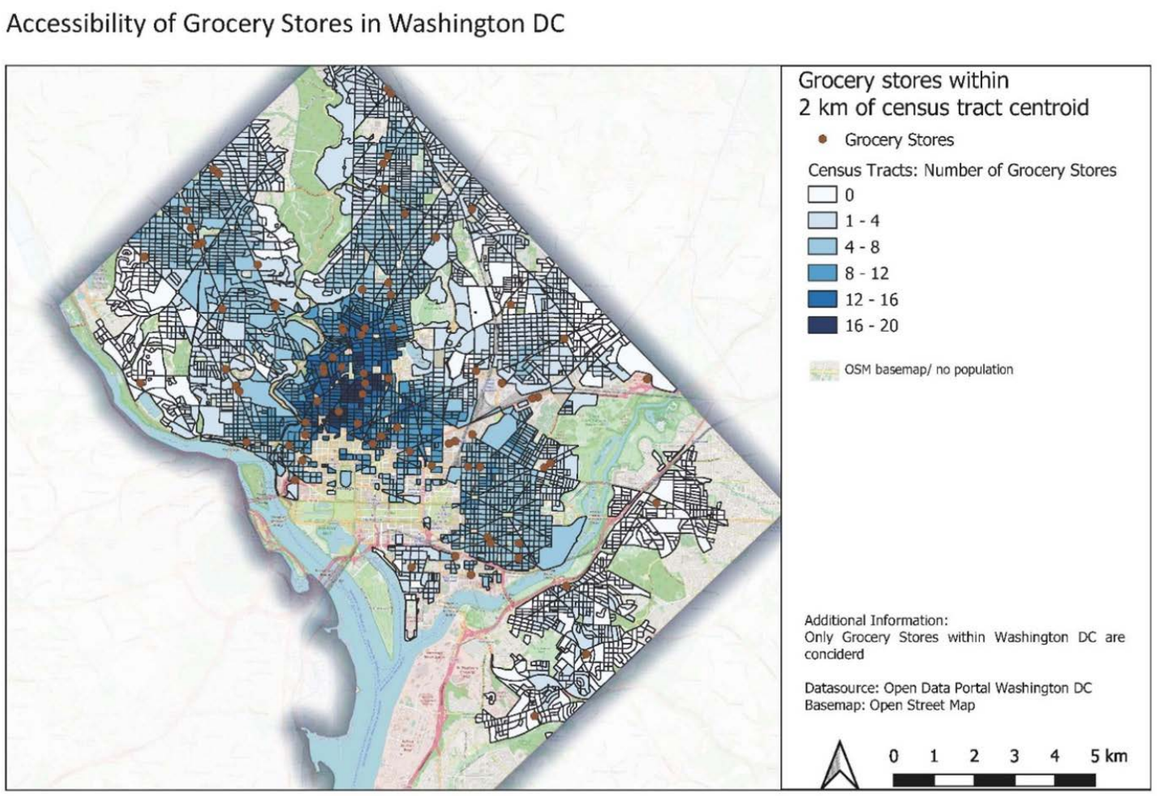
The course consists of a lecture and an exercise. It introduces fundamentals of spatial and behavioural data analysis for mobility research. Topics include: Fundamental concepts and terminology of mobility, travel behaviour research and spatial analysis; density measures and their impact on mobility; spatial autocorrelation; accessibility; modelling of travel demand and choices in the context of mobility behaviour.

Students understand relationships between spatial configurations (e.g. urban densities) and transport, are familiar with the basic concepts of travel demand modelling and understand the concept of choice modelling in the context of transport. Students are able to apply spatial analysis methods in QGIS, e.g. weighted densities, analysis of spatial autocorrelation, computing of accessibilities.

In the exercise, the contents of spatial analysis are deepened. Using the geographic information system QGIS, individual aspects of the lecture are deepened with the help of Open Data in the form of small tasks. It is not a prerequisite for the course to already know QGIS. Nevertheless, the focus is mainly on performing the analyses and not on learning the basics of QGIS. It is therefore suggested that students, in addition to the exercise, familiarize themselves with QGIS independently with the help of widespread tutorials. The learned methods for spatial analysis are embedded in a whole project process. Students work on a project in groups for the entire semester.

Learning Objectives

- Understand and apply spatial analysis techniques in the context of transportation systems.
- Understand key concepts of travel demand modelling and their applications in transport planning.
- Conduct mobility data analysis to interpret travel behaviour and mobility patterns effectively.



©Example for exercise work

Research Module
Urban heritage in UNESCO cities

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Dr. Javier Ostos Prieto

Dates
Wednesdays, 14.00-16.00, SG 301

Examination Date
23.07.2025

Examination Format
Oral presentation and booklet in PDF

Course Capacity: 10-15 Students

6 ECTS Points 30

2 SWS 12

Course Content
UNESCO World Heritage status in urban areas has helped the preservation of the historic city. However, there is an expectation that city growth has predominantly occurred on the surroundings rather than in central areas, constrained by heritage protection laws. In the case of Aachen, the incorporation of BufferZones into urban planning has restricted architectural interventions in the city center and modifications of land use on existing plots. This phenomenon can sometimes be favourable, as in the case of Seville, where the visual pollution of the Cathedral Bufferzone was greatly reduced. But it was also negative, leading to an excessive increase in tourism, displacing the local population to the urban periphery and leaving the historic centre totally depopulated.
The creation of guidelines and strategies at the urban level is foreseen to help balance heritage protection, urban development and sustainable energy promotion. To this end, it is expected to create urban plans for cities and UNESCO itself that can serve as a support for the definition of Buffer zones and protections in urban areas. This new instrument will help governmental institutions at national and local level to improve city management. Linking World Heritage and urban development is the key to achieving a resilient and sustainable city supported by the objectives of the Urban Agendas.

Learning Objectives
The main objective is to familiarise the student with the tools of urban planning for the analysis and protection of urban heritage. Through the morphological study of cities, the student should develop his own criteria and handle a methodology that will enable him to work professionally in heritage in the future. A morphological analysis as well as urban and heritage characteristics will be studied. In addition, proposals for heritage protection will be made in relation to the development of the building in its urban context.

Reading recommendations
ICCROM / ICOMOS / IUCN (2013). Managing cultural world heritage. World Heritage Resource Manual. Paris: UNESCO https://whc.unesco.org/document/125839
Martin, O. & Piatti, G. (ed.) (2009) World Heritage and Buffer Zones. In World Heritage papers, 25. Davos.
Turvey, K. (ed.) (2016) Understanding World Heritage in Europe and North America. In World Heritage reports, 43. Paris.

Bruges ©Javier Ostos Prieto

Research Module

Hack the Map! Collaborative Mapping for Spatial Justice

Module Responsible
Chair of Planning Theory and Urban Development
Prof. Dr. Agnes Förster

Teaching Staff
Dr. Robin Chang
Martin Bangratz

Dates
09.04.2025, 13.00-17.00, online
30.04.2025, 13.00-17.00, online
07.05.2025, 13.00-17.00, online
21.05.2025, 13.00-17.00, online
18.06.2025, 13.00-17.00, online
02.07.2025, 13.00-17.00, online

Examination Date
16.07.2025

Examination Format
Presentation and map submission

Participation criteria
Basic knowledge of QGIS (by completing the GIS-Box module or self-taught)

6 ECTS Points 30

2 SWS 12

Course Content

Maps are more than just tools for navigation—they shape our cities and how we perceive them. Who gets to decide what is mapped and what is left out? Can mapping be a tool for justice?

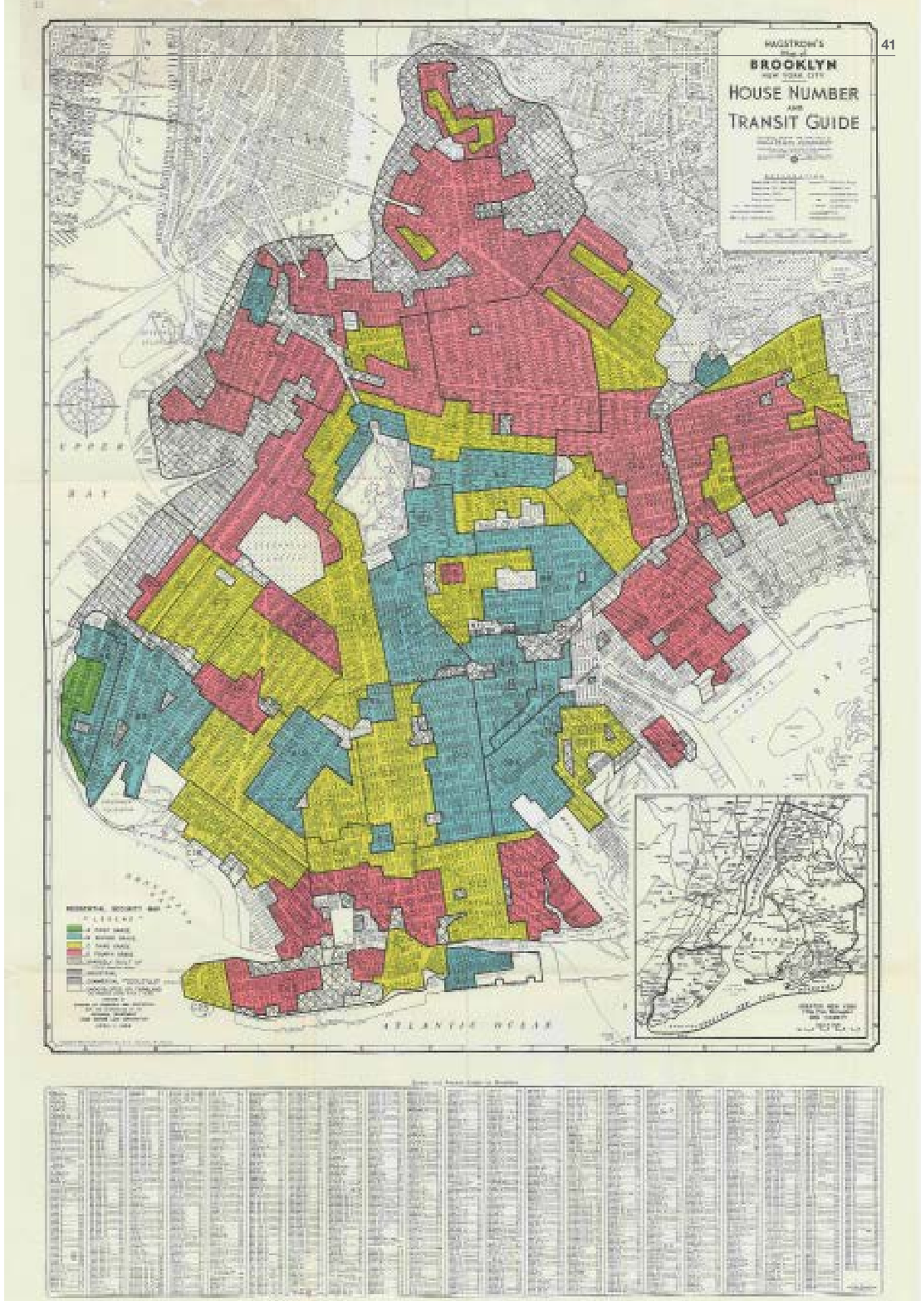
This research module explores critical and collaborative mapping as a way to challenge dominant urban narratives. From historical zoning maps to digital platforms, we'll examine how spatial representations influence inequality, access, and power in cities. Through case studies of grassroots mapping movements—from indigenous land rights to feminist geographies and crisis response—we will investigate how mapping can be used for activism and civic engagement.

What you'll do:
- Critically analyze real-world mapping projects
- Experiment with counter-mapping techniques
- "Hack" existing maps to uncover hidden narratives
- Collaborate to produce new, critical representations of space

Join us in redrawing the city. Every map is a story, and it's time to tell new ones.

Learning Objectives

- Considering the role of spatial data and maps in urban development
- A critical understanding of current dynamics of digital transformation affecting urban development and spatial justice in cities
- Practical application of spatial data analysis and visualization
- Developing academic research skills



Elective Courses

The elective courses supported by a multidisciplinary teaching staff are characterised by a broad spectrum of methodological, procedural, morphological, landscape architectural, ecological, legal, and economic aspects.

Elective Course
Unfolding City Complexity

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Dr. Stefano Cozzolino

Dates
11.04.2025, 13:00-15:00, SG301
18.04.2025, 13:00-15:00, SG301
25.04.2025, 13:00-15:00, SG301
02.05.2025, 13:00-15:00, SG301
09.05.2025, 13:00-15:00, SG301
23.05.2025, 13:00-15:00, SG301
30.05.2025, 13:00-15:00, SG301
13.06.2025, 13:00-15:00, SG301
27.06.2025, 13:00-15:00, SG301

Examination Date
18.07.2025 (subject to change)

Examination Format
Oral presentation based on a poster

Course Capacity: 10-20 Students

3 ECTS Points 30

2 SWS 12

Course Content
Jane Jacobs' The Death and Life of Great American Cities (1961) fundamentally reshaped the discourse on urbanism, challenging conventional planning and design paradigms. Nearly 65 years later, her ideas remain profoundly relevant, offering critical insights into the complex functioning of urban environments and suitable design approaches.

This course provides an in-depth exploration of Jacobs' theories, combining frontal lectures, roundtable discussions, and student-led presentations. Through a Jacobsian lens, students will develop methods to analyse the interplay between urban form, social structures, and economic activity, focusing on how the built environment shapes and is shaped by urban dynamics. Special emphasis will be placed on the composition and interrelation of physical artefacts, social aspects, and the spatial distribution of economic functions.

A core objective of the course is to operationalise Jacobs' principles into applicable methodologies for urban analysis and design. In doing so, students will engage in critical discussions, analytical exercises, and the investigation of design principles aimed at embracing the spontaneous and emergent order character of urban systems.

The course incorporates contemporary literature and case studies, bridging Jacobs' foundational ideas with contemporary urban challenges. Students will be expected to actively contribute to a collaborative learning environment and develop an independent case study in consultation with the instructor, applying Jacobsian principles to contemporary urban issues.

Learning Objectives
- To acquire proficiency in interpreting spontaneous urban dynamics
- To cultivate the skills necessary to unravel the interrelation between morphological, social, and economic systems
- To employ and integrate multiple research and analytical investigation methods
- To generate professional analyses that are accessible to both experts and non-experts alike.

- The final evaluation will consider the following aspects:
- Active participation throughout the semester, including in discussion rounds
- Quality of the case study's analysis and interpretation
- The final presentation and ensuing discussion

Reading recommendations
Jacobs, J. 1961. Death and Life of Great American Cities. New York: Random House.
Additional readings will be provided throughout the semester.

©Josh Cochran

Elective Course
Research Methods

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Prof. em. Dr. Andrea Haase

Dates
Thursdays, 14.00-16.00, SG301

Examination Date
17.07.2025

Examination Format
Group presentation – max. 3 students

3 ECTS Points 30

2 SWS 12

Course Content
Research by Design will help generating an experience of the reach of inductive approaches, - relating to local specifics and investigating by appropriate ways of SENSING the dynamics of urban transformation. SENSING means to develop knowledge, firstly by the senses, in addition to more scientific methods of testing and evaluating options for urban change by sketching/ illustrating/ modelling. As ideally worked on by a multi-disciplinary team, the students need to carry collectively the responsiveness for considering the major aspects of sustainability (social/ economic/ ecological) and the intended synthesis for an envisaged intervention by action in accordance to local culture.

Learning Objectives
The course prepares for DESIGNING/PLANNING by SENSING. It trains to enfold basic strategies for urban changes from a starting point (to be defined in its proven validity) to a final perspective (to be derived systematically from an evaluation of existing and also aimed to conditions). Techniques of SENSING help to combine scientific knowledge with sensual perception and imagination. The local quality of a healthy environment is to be searched for by a multi-scale approach. System-, modernisation-, and innovation theory are to be applied as parameters for evaluating existing conditions and outlined visions. Criteria are to be set up relative to the late industrial holistic understandings of “qualifying the environment” different from the obsolete routines of linear industrial urban development by “optimization” and “improvement”. Visions and their implied concepts, strategies and their measurements are to be enfolded, evaluated and argued for - by binding the sciences to the humanities.

Important reading recommendations
Glaser, B. G., (1978): Theoretical Sensitivity. Advances in the Methodology of Grounded Theory, Mill Valley: The Sociology Press

Glaser, B.G./Strauss, A. L. (1967): The Discovery of Grounded Theory. Strategies for Qualitative Research, Mill Valley: The Sociology Press

Strauss, A. /Corbin, J. (1996): Grounded Theory: Grundlagen Qualitativer Sozialforschung, Psychologie Verlags Union, Weinheim

Strauss, A. /Corbin, J. (1990): Grounded Theory Research: Procedures, Canons and Evaluative Criteria. In: Zeitschrift für Soziologie, 19, 418ff


©Andrea Haase

Impromptu Course
Pt.Talks

Module Responsible
Chair of Planning Theory and Urban Development
Prof. Dr. Agnes Förster

Teaching staff
Dr. Robin Chang
Martin Bangratz

Dates
09.04.2025, 16.30 – 17.30, Online
30.04.2025, 17.30 – 19.00, Online
14.05.2025, 17.30 – 19.00, Online
18.06.2025, 17.30 – 19.00, Online

Examination date
17.07.2025

Examination format
Written assignment

Attendance of talks, participation in discourse

1,5	ECTS Points	30
0,5	SWS	12

Course Content
The aim of this impromptu course is to engage in meaningful conversations about various topics in the area of planning theory and urban development with young scholars from a range of international institutions and disciplines. Participants will be invited to attend three Pt.talks, an established event series by Pt with the aim to foster a scientific and public discourse about current and emerging critical topics in urbanism. Within the guiding theme of global challenges for sustainable urban development, we see this format as an opportunity to explore new areas of research from different perspectives. Each talk will feature a young researcher giving a talk on a specific topic and provide for informal, open discussion among all guests. The format can give students an opportunity to network across thematic and geographical boundaries, exchange feedback, and be inspired by new inputs and discussions.

Students attending this impromptu course will produce summaries of each talk, supplementing their own conclusions by relating them to each other and to general topics of planning theory.

Learning Objectives
An understanding of current and emerging topics in urbanism
An opportunity to develop own ideas, contribute and network with researchers.

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Elective/ Impromptu Course
Sustainable ENHANCEment of Urban Centers

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher, Prof. Dr. Heribert Nacken

Teaching staff
Dr. Fabio Bayro Kaiser
Dr. Javier Ostos Prieto

Partner universities
Delft University of Technology; ETH Zürich; TU Berlin; Norwegian University of Science and Technology; Politecnico di Milano; RWTH Aachen University; Universitat Politècnica de València; Warsaw University of Technology

Dates
The course will be held as a compact online workshop during the excursion week (09.06.2025-13.06.2025)

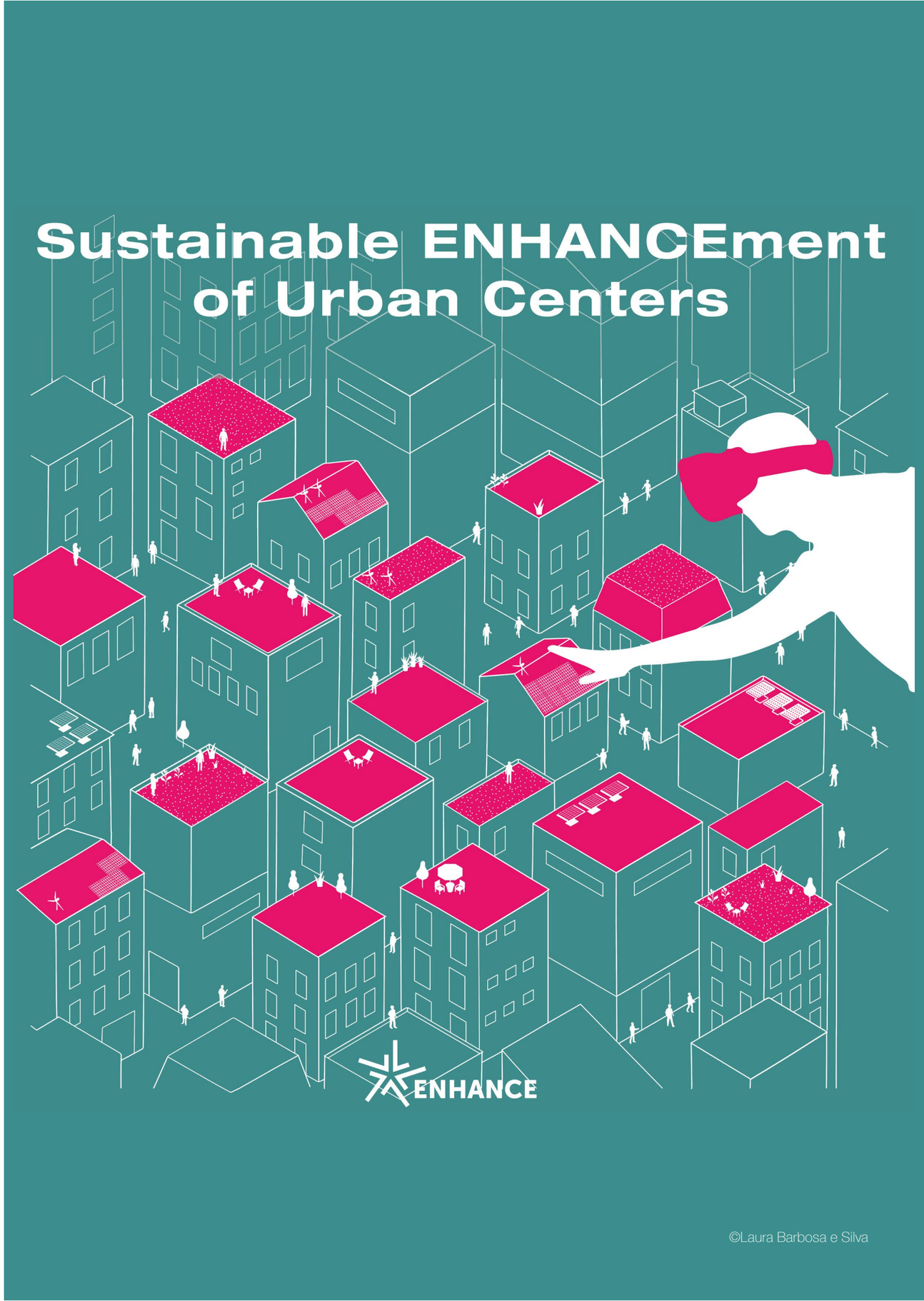
Examination date
13.06.2025

Examination format
Brochure, poster and oral presentation

1,5-3 ECTS Points	30
2 SWS	12

Course Content
Transforming cities to meet sustainable development goals is a pressing need, and rooftops and public spaces in the City of Aachen offer immense untapped potential to contribute to this transformation. The ENHANCE ICON course “Sustainable ENHANCEment of Urban Centers” will explore innovative design solutions using VR technologies to re-imagine Aachen’s urban landscape. Participants will explore the city in a virtual environment and propose sustainable interventions in key action areas such as solar panel installation, green space creation, local food production, water storage solutions, housing and community areas. By integrating these sustainable practices into the urban fabric, students will learn to address real-world challenges, collaborate across disciplines, and use cutting-edge technology to create resilient and vibrant urban environments. Through this immersive experience, participants will develop practical skills and insights that will prepare them to lead future urban sustainability initiatives.

Learning Objectives
This workshop will equip participants with skills in VR-based urban analysis, sustainable design and digital modelling. They will learn to integrate climate, emissions and environmental data to assess urban challenges and develop innovative solutions. Working in interdisciplinary teams, students will enhance their ability to communicate ideas, apply systems thinking, and collaborate across disciplines. The course strengthens technical skills in VR tools, critical thinking and project-based learning. By the end, students will be able to design, evaluate and present data-driven urban interventions.



Field trip / Elective / Impromptu Course

Trans Regio-express: cross-border daily urban system

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching staff
Nicole Maurer
Marc Maurer
Liyuan Ma

Dates
09.06.2025 – 13.06.2025, with followed-up sessions and submissions

Examination date
20.06.2025

Examination format
Oral presentation and report

Course Capacity: 5-15 Students

1,5-3 ECTS Points 30

2 SWS 12

Course Content

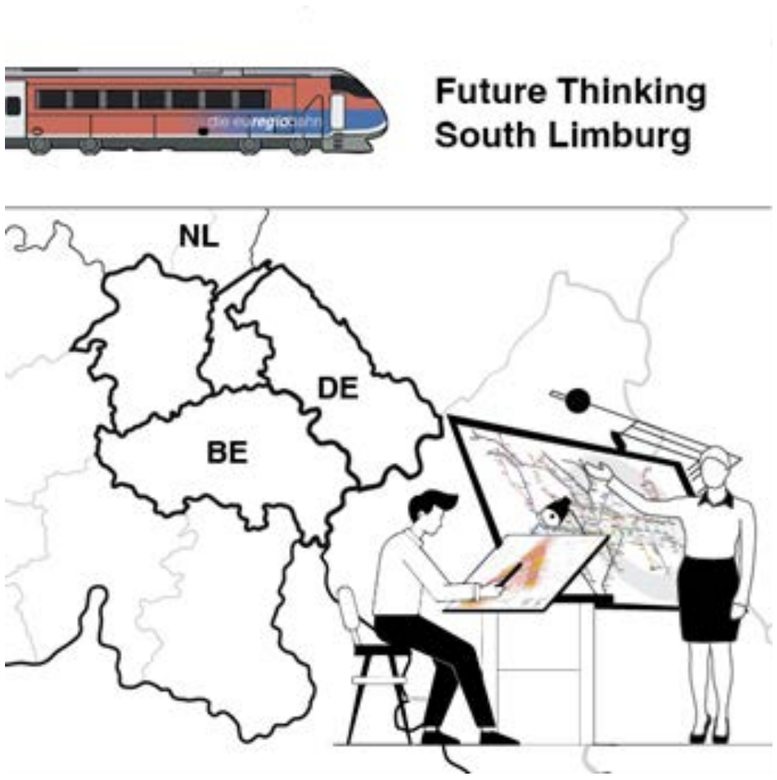
This workshop explores the future thinking of the cross-border daily urban systems in the Euregio Meuse-Rhine: covering South Holland, Western NRW, and East Belgium. It focuses on mobility, train stations, and daily life in a polycentric region, while having the national transportation network in mind. Unlike monocentric models, this region forms a network of sub-centres and peripheries. Each centre has its own identity and history, while peripheries foster new cultures. Understanding how people navigate this fragmented yet interconnected landscape is key to rethinking cross-border urbanism with unfair advantages in Europe.

Through a combination of field visits, expert discussions, and collaborative analysis, participants will gain insight about the socio-spatial interactions shaping border regions and the development of sustainable cross-border mobility network for daily urban system. Each session will feature a German or Dutch planner/researcher presenting on a specific topic related to cross-border mobility, followed by open discussions among participants. This format fosters an interactive learning environment at the New Regional Bauhaus, allowing students to network across thematic and geographical boundaries, exchange feedback, and gain inspiration from new perspectives.

The workshop will engage students in real-world case studies of cross-border train commuting, economic integration, and regional cooperation, in the Euregio Meuse-Rhine. Participants will interact with local stakeholders, urban planners, and researchers to explore the complexities of governance structures and mobility infrastructure challenges in trans-regional urbanism. Students will work in groups of two, each group will produce a final presentation, summarizing key findings and proposing strategies for sustainable Euregio train system.

Learning Objectives

- Gain insights into the mechanisms of daily cross-border mobility and regional integration.
- Analyse challenges and opportunities in trans-regional mobility planning in the Euregio Meuse-Rhine.
- Engage with experts and practitioners in the field.
- Develop strategic spatial concepts for cross-border urban development.



Master Thesis Suggested Topic

Tackling Energy Poverty through Placemaking in Hoensbroek, Heerlen

Module Responsible
Chair of Urban Design and Institute for Urban Design and European Urbanism
Prof. Christa Reicher

Teaching Staff
Dr. ir. Ceren Sezer
Alper Al
Liyuan Ma
Dr. Aslı Alanlı

Dates
Mondays, 13.00-17.00
Starting date: 07.04.2025
Midterm presentation: 02.06.2025

Examination Date
04.08.2025

Examination Format
Oral presentation, poster presentation and report

Course Capacity: 16 Students

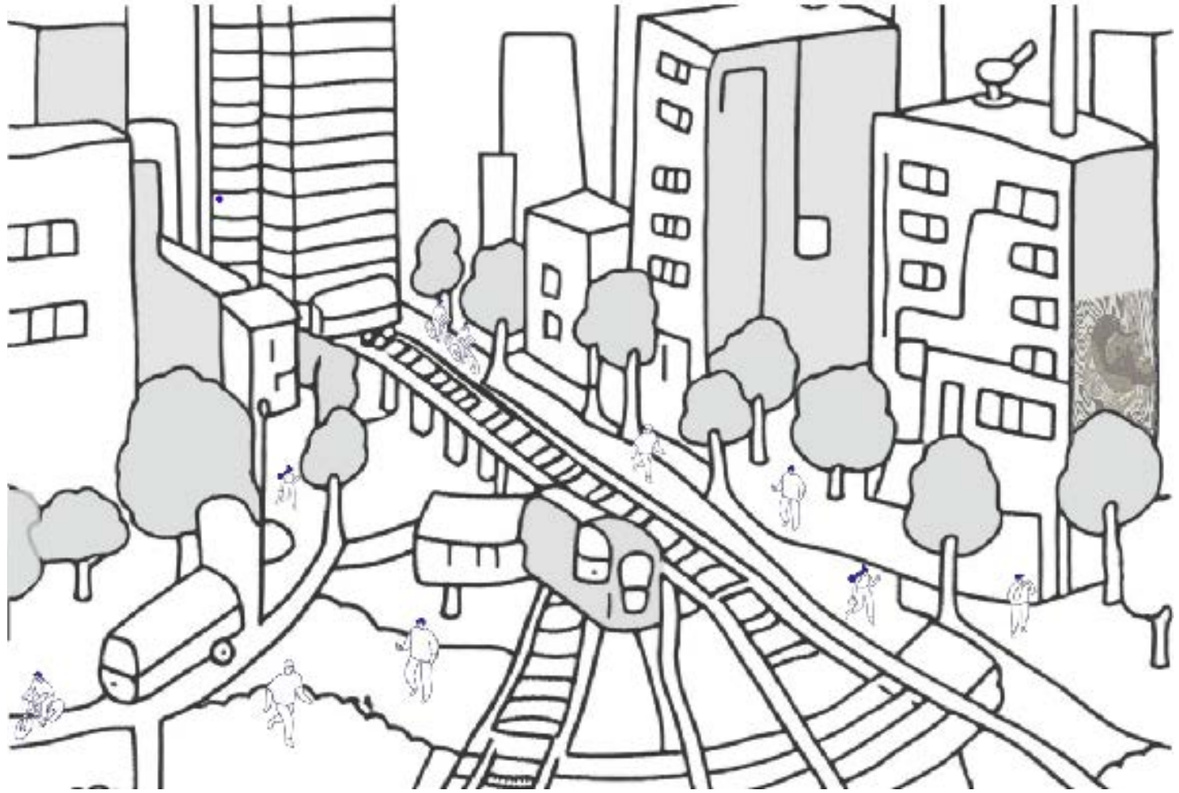
30 ECTS Points 30

0,5 SWS 12

Course Content
This suggested topic explores placemaking as a strategy to mitigate energy poverty, improving both the spatial and social fabric of Hoesnbroek. Hoensbroek, a former mining district in Heerlen, faces socio-economic challenges linked to its post-industrial transformation. The decline of the mining industry has left a legacy of energy poverty, underutilized public spaces, and social fragmentation. The studio will challenge students to develop integrated spatial solutions that address: energy poverty and affordability, public space revitalisation, sustainable mobility and accessibility, and climate responsive design. The studio will combine quantitative and qualitative research, engaging with local stakeholders, energy experts and residents to co-develop solutions. Methods include: spatial mapping and data analysis; community participation; short and long-term site-specific urban design proposals to integrated community-led energy initiatives, energy efficient housing, and climate adaptive public spaces for long-term sustainability. The studio outputs will contribute to the broader discussion on just energy transitions in post-industrial areas. The students are going to work on design proposals and present their work as oral presentations, and reports.

Hoensbroek is located northwest of Heerlen and has about 20,000 inhabitants. Due to mining history, most of the workers' quarters and vacant lands are present. With the cessation of mining activities in 1965, the city began to lose its economic and social attractiveness, faced with urban abandonment and unemployment. The city needs sectors and spatial strategies to revitalize its economy and public realm. To address this, the Structural Vision 2035 is adopted to tackle the existing real estate and vacant urban spaces.

Learning Objectives
Students will learn to analyse and address energy poverty through spatial design and placemaking strategies in post-industrial contexts. They will develop skills in spatial mapping, data analysis, and community engagement, integrating social, economic, and environmental factors into urban design. By working with local stakeholders, they will practice participatory planning and propose site-specific, climate-responsive interventions that enhance public space, mobility, and energy efficiency. The course will foster critical thinking, interdisciplinary collaboration, and policy awareness, equipping students to contribute to just energy transitions and sustainable urban regeneration. Outputs include design proposals, presentations, and written reports.



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Master Thesis Suggested Topic

From Green Corridor to Food Corridor: designing Grünzug F as a productive landscape

Module Responsible

Chair and Institute of Landscape Architecture

Prof. Dr. Frank Lohrberg

Contact

Dr. Axel Timpe

timpe@la.rwth-aachen.de)

30 ECTS Points 30

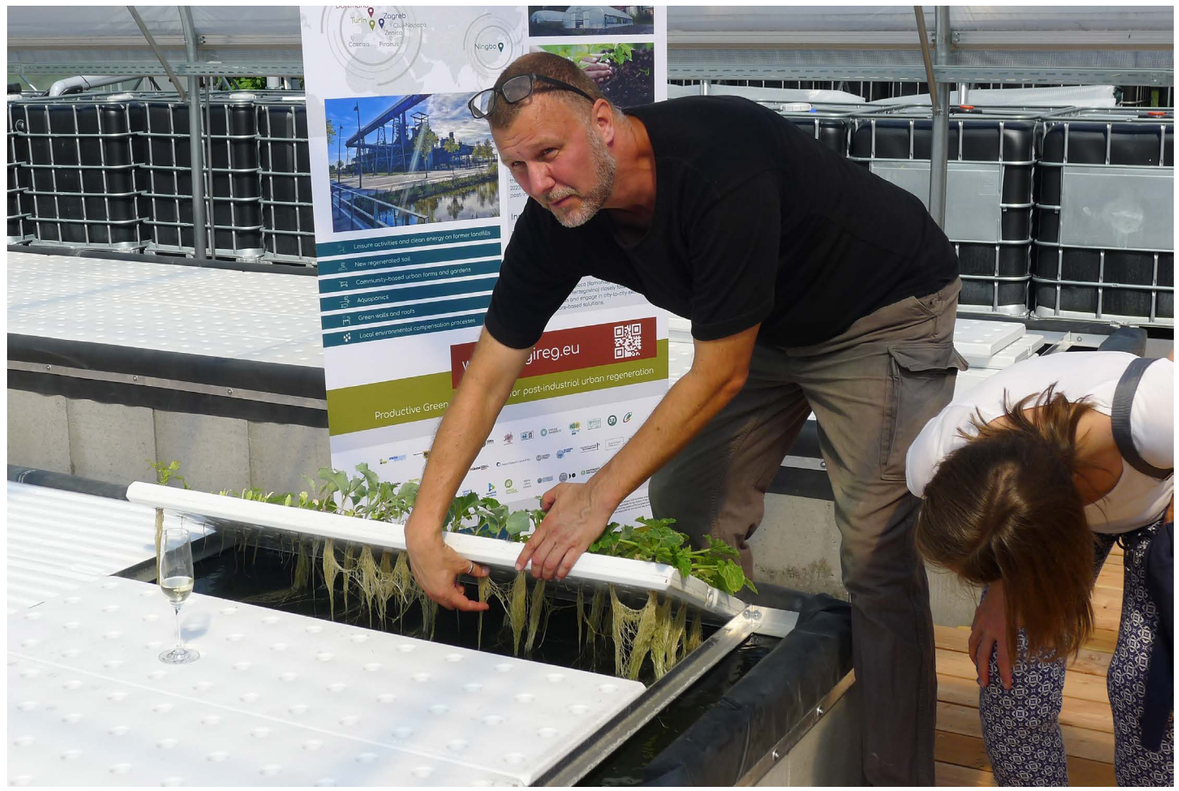
0,5 SWS 12

Course Content

How will the cities of the future feed themselves? A post-fossil, CO2-neutral society, as envisaged by the Green Deal for Europe, must also find new, locally organised ways of producing and processing food. The focus of this development is on shortening supply chains and controlling production conditions as well as the additional benefits for the local community, individual health, social interaction and much more. Agriculture in the city brings people together and is an important component for a sustainable, climate-neutral and resilient city of the future.

In urban areas, the multifunctional combination of green infrastructure with food production offers particular opportunities for this transformation, which were first identified in the concept of Continuous Productive Urban Landscapes (CPULs) (Viljoen et al. 2005). With its regional green corridors created since the 1920s, the Ruhr metropolis has a green infrastructure that largely consists of productive landscapes and can be further developed in line with CPULs. The research project CoProGrün, coordinated by the Institute of Landscape Architecture, has initiated a stakeholder process for the further development of green corridor F ‘Östliches Emschertal’ (Eastern Emscher Valley). This was continued with initial pilot projects such as the routes of agrarian culture showcasing different types of agriculture (Ruhr 2025). In the Horizon 2020 project proGIreg, another research project coordinated by the Institute of Landscape Architecture, a new form of agriculture was realised in the green corridor with the aquaponics plant on the former Hansa coking plant in Dortmund Huckarde. This will also become part of the International Garden Exhibition in the Ruhr Metropolis in 2027. Civil society initiatives like the Dortmund Food Council think about CPUL elements in the Schlaraffenband project as well.

The Master Thesis assignment asks for concepts and plans how the transformation towards a food corridor can be continued and take concrete forms in a productive landscape design including various existing or future forms of agriculture and its stakeholders in and around the green corridor and the Hansa Coking Plant.



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ENHANCE

„Together with six other leading technical universities, RWTH Aachen University has founded the European alliance ENHANCE – European Universities of Technology Alliance.“ (RWTH, 2023)

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Field trip / Elective / Impromptu/ Transit Course

ENHANCE Summer School - Synergic Urban Systems

Organizers
RWTH Aachen, TU Berlin, Politecnico di Milano, Norwegian University of Science and Technology, Polytechnic University of Valencia, Warsaw University of Technology, ETH Zurich

4 ECTS Points 30

Dates
Application deadline: 22.04.2025
Online phase: 11.08.2025 - 28.08.2025
Onsite phase: 01.09.2025 - 06.09.2025 (6 days)

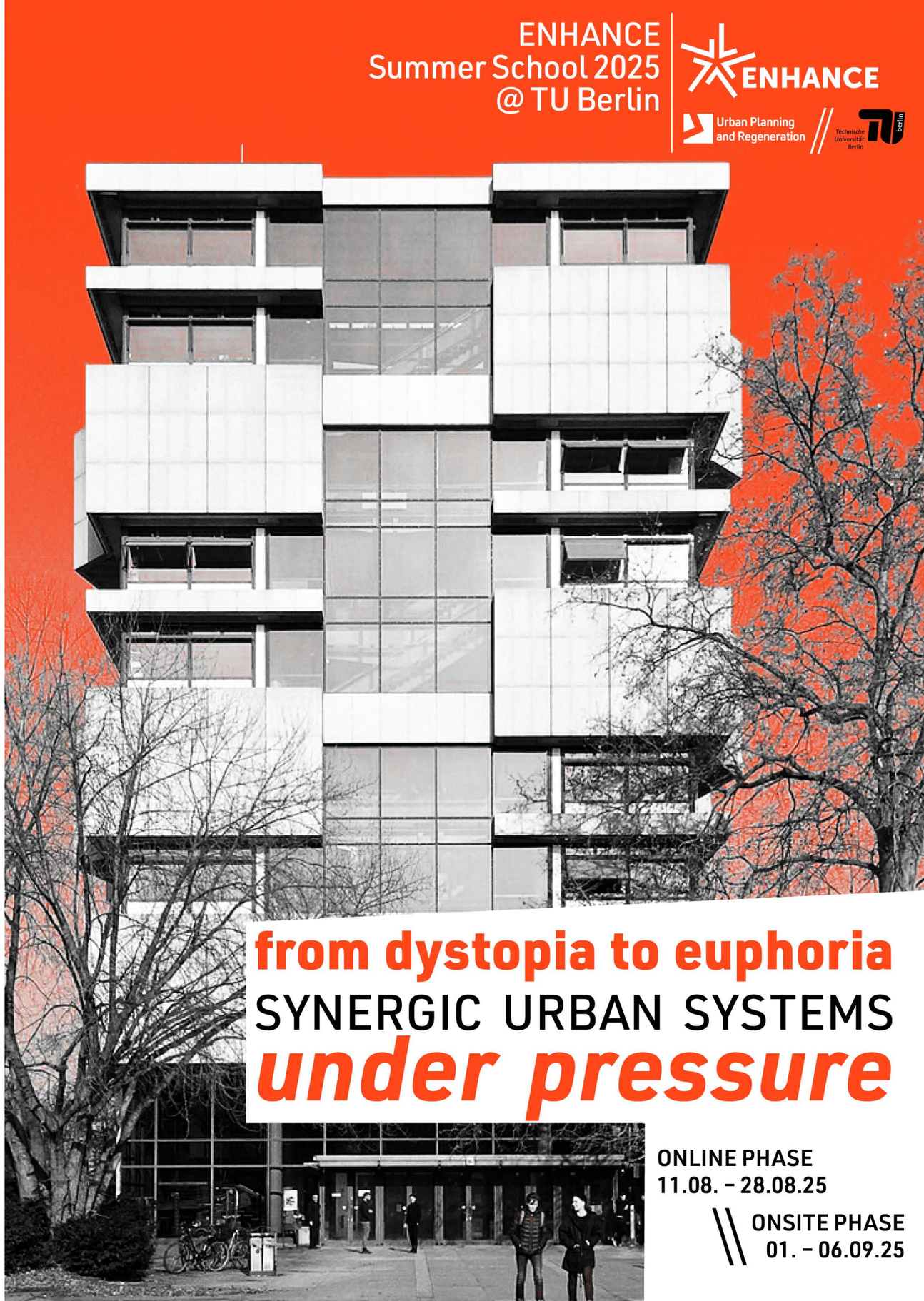
Location:
Technische Universität Berlin, Germany

Can be credited as a Field Trip, an Impromptu, a Transit or an Elective Course.

Course Content
Join the ENHANCE Summer School SYNERGIC URBAN SYSTEMS to learn how to design innovative interdisciplinary approaches to urban systems integration across key sectors, including mobility and connectivity, blue-green infrastructures and ecosystem services, social life and communities, urbanity and density, resources and circularity, culture and heritage

Please find more information on:
Event page and Application Form
ENHANCE course catalogue

Contact:
Christian Larisch- larisch@staedtebau.rwth-aachen.de



ENHANCE
European Education Pathways

Partner Universities
RWTH Aachen Universtity
Chalmers University of Technology
Norwegian University of Science and Technology
Politecnico di Milano
Technische Universität Berlin
Universitat Politècnica de València
Warsaw University of Technology

Facts & Figures
7 Partner universities
5 study programmes
Hundreds of pre-approved courses
Automatic recognition of ECTS credits
Embedded virtual mobility
Two-semester mobility funded

„What are the European Education Pathways?
The European Education Pathways are part of the ENHANCE vision of creating One European Campus among the partner universities. European Education Pathways are a system of shared learning goals and outcomes, a subject mapping tool that allows students to select courses across all educational offers of the partner institutions.

Through this initiative, the ENHANCE Alliance promotes a seamless physical and virtual mobility giving the students the opportunity to take curricular courses within their study paths from the educational offer of several partner universities.

The courses offered within the European Education Pathways are pre-approved and the recognition of ECTS credits is guaranteed.

The ENHANCE Alliance foresees extending the number of study programmes involved, providing partner institutions with a framework for deeper international cooperation and exchange and an increasing number of students with a wider European experience.“
(ENHANCE, 2023)

„Which are the Benefits of Enhance?
- Become part of the ENHANCE Alliance
- Design your personal education pathway by choosing from the offer of the leading European universities of technology
- Access the catalogue of pre-approved courses specially selected by all the universities of the ENHANCE Alliance
- Build your own study plan without difficulties by selecting from the list of courses inside the EEPs Catalogue. All of them have been pre-approved by your home institution.
- Enjoy the pre-approved of ECTS credits. You do not need to worry anymore about getting your ECTS recognised by your home university
- Upon your return, the ENHANCE partners automatically recognise ECTS obtained abroad and your transcript will be updated“
(ENHANCE, 2023)

Courses
- Social Ecological Urbanism, Chalmers
- Methods for Participatory Planning, Co-Design and Localizing SDGs, NTNU
- Globalisation and Urban Development, NTNU
- City And Territory: Intervention Instrument, UPV
- Digital Modelling, WUT
- Planning Theory A - Plannig as Political Process 1, TUB
- Global Urban Challenges: Concepts and Context, Polimi

... and many more!

Recommendations
https://enhanceuniversity.eu/
https://www.rwth-aachen.de/cms/root/studium/Im-Studium/Internationales/Outgoing/Studium-im-Ausland/~qilvx/ENHANCE-European-Education-Pathways/?lidx=1

Check this for further information!

!

Master Thesis

Brief information before starting to the project work and presentation of the thesis. Master thesis shall be prepared within one semester time. The presentation and defence of the thesis will take place at the end of the 4th semester

Augmented Reality for Community-based Collaborative Design:
A Case Study of RWTH Aachen University Campus Transformation

First Supervisor: **Univ.-Prof Dipl.-Ing. Christa Reicher**
Chair of Urban Design and Institute for Urban Design and European Urbanism
RWTH Aachen University

Second Supervisor: **Prof. Dr. Bige Tunçer**
Chair of Information Systems in the Built Environment
Eindhoven University of Technology

Author: **Liyuan Ma**
Master of Arts
Transforming City Regions
Faculty of Architecture
Matriculation No. 432772
Winter semester 2024/25

1 THESIS FRAMEWORK

Introduction

The Role of Collaboration in Urban Design
Urban design is a collective effort requiring collaboration among multiple stakeholders to balance diverse interests and promote sustainable development. Aligned with the Leipzig Charter (2016) and Sustainable Development Goals (2015) emphasize participatory planning and inclusive public spaces. However, a key challenge remains: bridging the gap between professional design proposals and inclusive public engagement.

Limitations of traditional visualization tools
Traditional tools—static renderings, models, and 2D maps—facilitate communication but lack spatial depth, interactivity, and engagement. Augmented Reality (AR) offers an immersive alternative, allowing participants to visualize and interact with designs in real-world settings. This study explores AR's role in sustainable campus transformation.

Exploring AR in campus design
Despite AR's potential in architecture and urban design, its use in public participation planning is underexplored. Universities, as sustainability leaders, can leverage AR to engage students—a key campus users and future change-makers. This research examines AR's impact on student participation in RWTH Aachen's campus transformation.

Research Objectives
This study evaluates AR's ability to enhance understanding, motivation, and collaboration in campus design. By comparing AR with traditional tools, it aims to provide practical insights for AR in urban planning. The study includes three components:
- A real-world open-space transformation at RWTH Aachen.
- Development of an AR tool for collaborative campus design.
- Workshops testing AR's effectiveness.

Research questions

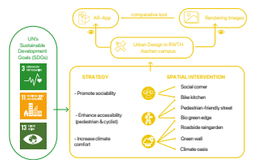
The research is guided by the following questions:

1. *How effectively can AR facilitate understanding of sustainable campus concepts and motivate collaborative campus open space design among university students?*
2. *What specific features of AR enhance userww understanding and engagement in collaborative sustainable campus open-space design?*

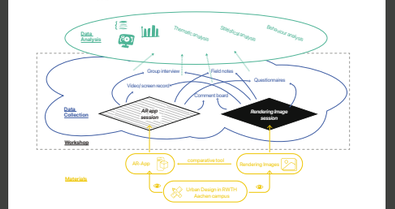
2 MATERIALS:

Focus area

Transformation strategies



Methodology



The study employs a workshop-based approach, combining participatory campus workshops with AR-assisted design interventions. Data is collected through structured interviews. Amundsterbach Straat is the site in the RWTH Aachen University's campus—was selected as the focus area to provide real-world problem scenarios. The site's challenges—including flooding, high traffic volume, and limited pedestrian mobility—inefficiencies—were addressed through AR-enabled design strategies aligned with the SDGs.

Two participatory tools—a mobile AR app for iPad and static rendering images—were developed and tested in an on-site workshop with students, with data collected through observational methods and documentation (e.g., video recordings, screen captures, annotated maps, and qualitative methods such as questionnaires and interviews. The collected data were analysed using a combination of thematic analysis for qualitative data and statistical methods to evaluate AR's effectiveness in fostering engagement, understanding, and motivation in participatory urban design.

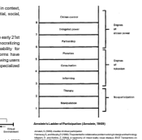
Background & Theory	SDGs guide design criteria; Arnstein's Participation Ladder evaluates participation levels
Data Analysis	Quantifying and comparing questionnaire results; comments classification; behaviour analysis.
Data Collection	Likert-scale questionnaire during workshop; observation with photo and video recording; interactive comment board.
Workshop	Workshop with university students to create a controlled test environment for evaluating user interaction with two tools.
Materials	Urban design of campus open space transformation, represented by 2 visualization tools: AR app and rendering image

Augmented reality in collaborative urban design

Collaborative design and visualization
Collaborative design relies on effective communication and shared understanding among participants to define goals, explore problems, and co-create solutions. Visualization is central to this process, serving as a common language that bridges diverse perspectives. It can be understood as a Ladder of Participation, informing the public in the first step, with visual information playing a key role. Traditional tools like sketches and physical models aid communication but often fail to convey complex, dynamic environments. Immersive real-time interaction, in scale to diverse groups.

Augmented reality as a solution
Augmented Reality (AR) addresses these limitations by overlaying digital content onto the physical environment, allowing users to interact with 3D models overlaid onto real-world settings. Unlike Virtual Reality (VR), which fully immerses users, AR enhances rather than replaces reality. This makes it a powerful tool for collaboration, as AR's ability to retain real-world elements—such as light, wind, and sound—while adding digital layers helps stakeholders experience designs in context, deepening their understanding of spatial, social, and environmental constraints.

Advancements in AR technology
The rise of smartphone-based AR in the early 21st century has significantly reduced the barrier to accessing AR and expanding its usability for diverse stakeholders. Mobile AR platforms have significantly lowered entry barriers, allowing users to engage with AR content without specialized hardware.



AR offers several key advantages for enhancing urban design collaboration:

1. **1:1 Scale visualization**: AR allows stakeholders to view 3D models at their actual size within the real environment, providing an intuitive understanding of scale, proportion, and spatial relationships
2. **On-Site experience**: Users can explore AR content individually or collectively on-site using personal devices, fostering autonomy and engagement.
3. **Dynamic perspectives**: AR enables users to move freely and view designs from multiple angles, enhancing spatial literacy and contextual understanding.
4. **Interactivity**: AR supports real-time interaction with both virtual and physical elements, encouraging active participation and co-creation.
5. **Sensory preservation**: By preserving the natural features of the real world, AR creates a more immersive and realistic experience, helping stakeholders evaluate designs in context.
6. **Supplementary information**: AR applications can provide additional context through embedded videos, text, or images, enriching the design discussion and decision-making process.

Augmented reality in campus development

Leading role of universities
University campuses are increasingly being reconfigured as living laboratories, where innovative technologies and sustainability principles are tested and implemented. Given their influence and their capabilities, universities must take a leadership role in advancing the UN's Sustainable Development Goals (SDGs), leveraging their research, education, and campus operations to drive transformative change. By aligning strategies with the SDGs, universities not only address future leaders but also set up examples for future sustainable practices.

RWTH Aachen University's Sustainability Strategy
RWTH Aachen exemplifies this trend through its sustainability strategy, which integrates research, education, and campus life with sustainability goals. The university actively involves students, staff, and external stakeholders, recognizing that inclusive collaboration is key to a sustainable campus. AR, with its ability to visualize complex concepts—such as green infrastructure, flood-resilient design, and green mobility—in an interactive way, aligns with RWTH Aachen's focus on engagement and co-creation.

Students as focus group
This study focuses on students as both primary users of the campus and catalysts for sustainability transformation. RWTH Aachen acknowledges their role in participatory processes, valuing their fresh perspectives, technological fluency, and commitment to shaping their environment. Integrating AR into campus transformation not only enhances engagement but also equips students with innovative tools to address global challenges in their future careers. The key question is whether AR can effectively support collaborative design in this context.

AR app development

This research developed a mobile AR app as the chosen format for AR technology in participatory urban design workshops. The app was developed for iPad to ensure high compatibility with everyday devices, such as smartphones and tablets, making it an ideal medium for inclusive participation in urban design workshops. The AR app was specifically developed for use on iPad to facilitate the workshop process. Static renderings, such as bird's-eye view rendering images, a widely adopted communication tool in urban design, were selected as a comparative tool to support participation. Both tools were designed and prepared to effectively visualize and communicate the same proposed spatial transformation.

The AR content include the 3D model of the campus transformation design transformation, as well as 3D people and vegetation models. These digital and physical elements were integrated into the AR app to enhance user engagement. Each design element from the spatial plan was associated with a floating "star" object. These "stars" appeared as interactive icons in the AR scene and provided detailed information when users approached them. The text included descriptions of the design features and their expected contributions to sustainability. This interactivity enabled participants to not only gain the spatial understanding of the design but also understand its reasons and alignment with sustainability principles.

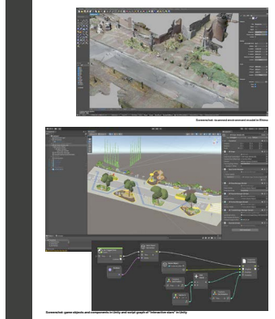
Adopted AR software workflow

	3D scanning	>> 3D modelling	>> AR Programming	>> Build to device
Purpose	Building real environment 3D model of focus area	Building 3D model of proposed spatial design	Building model into AR environment	Building application to AR device
Software	Polycam for iOS V. 4.0.10	Rhinoceros 8	Unity V 2022.3.46 Apple ARKit V 5.1.5 AR Foundation V. 5.1.5	XCode 16.2 iPadOS16 macOS 14 iOS 18
Hardware	iPhone 13 pro with LiDAR	No specific	Macbook	Macbook iPad Pro 2017 iPad Air 2022 iPad mini 2021 iPhone 13 Pro

Development and of AR app
The AR app was designed and developed using Unity, a widely used game engine for interactive 3D applications. Unlike the traditional workflow for producing rendered images, developing the AR app required a distinct approach to both modelling and programming. The AR model needed to be optimized for real-time performance and carefully set to ensure accurate alignment with the real-world environment.

To achieve this, the author first scanned the site using a LiDAR sensor on a smartphone. The scanned model was then exported to Rhinoceros 3D, where the spatial design of the focus area was modelled at a 1:1 scale. The AR objects were subsequently exported to Unity, where materials and textures were applied to enhance visual realism. Apple's AR Foundation was integrated to facilitate AR experiences, with Apple ARKit selected as the primary plug-in package for deployment on iPad.

The AR app employed a 2D marker-based tracking method to anchor the virtual 3D model within the real-world context. The marker, detected by the iPad's camera, served as a reference point for positioning and orienting the virtual model on-site. During workshops, the marker had to be placed at a predefined location to ensure seamless alignment between the virtual model and the physical environment.



Rendering images

Static Renderings for Spatial Visualization
A set of static renderings was created using 3D rendering software to visualize the same spatial design content presented in the AR application. These images served as a comparative tool to support participation in participatory urban design proposals in participatory processes. The rendering set included one bird's-eye view, providing a comprehensive overview of the proposed street design, and four street-level perspectives that highlighted specific design elements and spatial qualities.

To ensure consistency with the AR experience, interactive elements from the AR app, such as the "stars" indicating key design features, were translated into text boxes within the static renderings. This allowed participants to access the same information as the AR interface, ensuring that both mediums provided equivalent content for evaluation. The images were printed in DIN-A4 format.

Comparative Approach in Participatory Design
This research adopted a direct comparative approach to evaluate AR alongside static renderings as participatory tools in urban design. By presenting identical spatial transformations through both mediums, the study aimed to assess AR's potential advantages in fostering engagement, comprehension, and interaction. Participants engaged with both tools during the workshop, allowing for a direct assessment of their effectiveness in communicating spatial design concepts.

By comparing usability, performance, and participant experiences, the study sought to determine whether AR enhances understanding and engagement beyond traditional methods. The findings contribute to broader discussions on integrating interactive technologies into collaborative urban design, balancing innovation with accessibility in participatory planning.

Augmented Reality for Community-based Collaborative Design:
A Case Study of RWTH Aachen University Campus Transformation
Supervised by:
Prof. Dipl.-Ing. Christa Reicher, Chair of Urban Design and Institute for Urban Design and European Urbanism, RWTH Aachen University
Prof. Dr. Bige Tunçer, Chair of Information Systems in the Built Environment, Eindhoven University of Technology

Before Starting to the Thesis
Information

Dates
Application for admission of external second examiners:
Deadline 20.08.2025
(Contact: bayrokaiser@staedtebau.rwth-aachen.de)

Application for admission (ZPA):
Deadline 03.09.2025
(Contact: marion.matheis@zhv.rwth-aachen.de)

30 ECTS Points 30

0,5 SWS 12

Requirements
- At least 81 credits completed
- Module **Scientific Integrity** completed
- Free or suggested topics are possible
- Theoretical scientific work or a design project are possible
- English or German language is possible
- It is an individual work, but materials and research/design questions can be prepared as a team
- Two examiners: The first must be from the faculty. The second can be from the faculty, university, or external. Both supervisors must be ful professors.
- Single right of return
- Online submission via CMS DIVA: **Tutorial**
- Max. 80 pages
- Citation style to be discussed with the examiner
- If applicable, 2 Reiff-Walls for design posters + maquette(s)
- Joint (public) examinations

Resources
RWTH Examination Regulations
TCR Examination Regulations
TCR Moodle Room

Thesis Dates and Deadlines
Winter Semester 2025/2026

Free Topic

NOW	Work on the topic and task Contact a chair/institute for supervision. Clarify requirements and conditions for supervision. Also dates and deadlines.
02.06.2025–13.06.2025	**Declaration of intent for the thesis in RWTH online**
by 20.08.2025	Request for approval of external supervisors
by 03.09.2025	**Submission of “Application for Admission” at the ZPA** (incl. confirmation of supervision)
12.09.2025	**Start of Master Thesis** 5 months of independent work With colloquia and individual consultations if necessary
12.10.2025	Single right of withdrawal
09.02.2026	**Online submission of thesis**
13.02.2026	**Hanging of posters and maquettes**
17.02.2026–19.02.2026	**Master examinations**

Suggested Topic

NOW	Work on the topic and task Explore chairs/institutes and their topics.
02.06.2025–13.06.2025	**Declaration of intent for the thesis in RWTH online** Selection of suggested topic
by 03.09.2025	**Submission of “Application for Admission” at the ZPA** (incl. confirmation of supervision)
12.09.2025	**Start of Master Thesis** 5 months of independent work With colloquia and individual consultations if necessary
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TRANSFORMING
CITY REGIONS

Impressum

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