URB-420

Core project: Urban Systems studio

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Cursus	Sem.	Type
Systèmes urbains	MA1, MA3	Obl.

Language of teaching	English
Credits	10
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	300h
Weeks	14
Hours	**10 weekly**
Courses	2 weekly
Project	8 weekly
Number of positions	

Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription.

Remark

Uniquement en MA3.

Summary

Interdisciplinary urban design studio addressing site and territory through multiple urban systems. Combines architectural, infrastructural, and social approaches to develop critical, experimental, and context-responsive urban interventions.

Content

How can urban and territorial system respond to the multiple and complex challenges of the socio-ecological transition? The project-based studio combines theory and design to address the systemic socio-ecological transformation of cities and territories. Students develop multi-scalar, quantified and spatialized strategies in grounded contexts, integrating social, ecological and economic dimensions of design, with particular attention to metabolic processes, mobility, governance and planetary boundaries.
The studio addresses the systemic design of socio-ecological transition in cities and territories.
Main components :

- Planetary boundaries and territorial implications
- Urban and territorial metabolism (flows, stocks, entropy)
- LCA of cities and territorial carbon/resources accounting
- 2000-Watt society and fossil-free trajectories
- Renewable energies at large scale
- Biodiversity, agriculture and living systems
- Climate change adaptation
- Mobility systems and intensities of use
- Soil typologies and land-use transitions
- Offer / demand / stock reasoning applied to major flows
- Multi-dimensional urban design (EUT + â#¬ + aesthetics + EMC2B logic)
- Governance, political economy and power relations in territorial change
- Social dimensions of urban design: socio-spatial justice equity and inclusivity

Pedagogical structure:

- Combination of lectures, methodological workshops and project-design studio
- Real case studies (Switzerland and Europe), with institutional or NGO partners
- Groups of 3 students
- Projects differing by context, spatial scale (neighborhood to region) and temporal scale (short-term implementation to long-term transition)
- Sites accessible from Lausanne within low-carbon mobility constraints

Keywords

Urban and territorial metabolism; socio-ecological transition; planetary boundaries; LCA of cities; carbon accounting; resource accounting; entropy of cities; renewable energy systems; biodiversity; socio-spatial justice ; climate adaptation; mobility systems; multi-scalar design; systems thinking; governance; territorial strategy; data visualization; Sankey diagrams; prospective urbanism

Learning Prerequisites

Recommended courses

Introductory courses in urban systems, environmental sciences, sustainability, or territorial planning

Important concepts to start the course

- Basic systems thinking
- Basic socio-economic understanding
- Fundamentals of energy and carbon reasoning
- Quantitative reasoning and orders of magnitude
- Basic cartographic and spatial representation skills

Learning Outcomes

By the end of the course, the student must be able to:

- Analyze a territory as a socio-ecological system integrating infrastructures, land, built form, uses and governance.
- Quantify major urban and territorial flows (energy, materials, carbon, climate vulnerabilities, mobility, land use) using appropriate metrics.
- Assess / Evaluate place quantitatively through multiple medium (interview, picture, drawing, etc.)
- Interpret territorial development in relation to planetary boundaries and climate constraints.
- Develop multi-scalar transition strategies combining spatial, technical and socio-economic dimensions.
- Integrate LCA, carbon and resource accounting into spatial design propositions.
- Model mobility systems and their interaction with land use, urban tissues and metabolic performance.
- Design incremental and long-term territorial projects grounded in real political and economic contexts.
- Visualize complex territorial systems through maps, Sankey diagrams and data-driven representations.
- Critique the coherence between quantitative assessment, governance mechanisms and spatial design.
- Argue and defend a systemic territorial vision before academic and professional audiences.

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Use a work methodology appropriate to the task.
- Take account of the social and human dimensions of the engineering profession.
- Collect data.
- Make an oral presentation.
- Demonstrate a capacity for creativity.

Teaching methods

- Theoretical lectures on systemic urban transition
- Methodological workshops (LCA, carbon accounting, metabolic diagrams, mobility modelling)
- Studio-based project work in interdisciplinary teams
- Site visits and meetings with institutional actors (e.g., territorial offices, transport agencies, NGOs)
- Interim reviews and final jury with external experts
- Critical seminars and collective debates

The course builds on prior teaching experiences such as "2050, sous le soleil exactement" (EPFL, 2015-2016) and the DPEA Architecture Post-Carbone (ENSA Paris-Est, 2013-2018), extending them within the MUS framework.

Expected student activities

- Attendance to lectures and workshops
- Data collection and processing
- Urban and architectural theory and history of planification
- Quantitative modelling (carbon, energy, mobility, resource flows)
- Development of multi-scalar spatial scenarios
- Production of maps, diagrams, Sankey visualizations and project representations
- Physical and/or digital models
- Oral presentations and participation in reviews
- Engagement with academic and professional literature

Assessment methods

- 60% Group project (quality of systemic analysis, integration of metrics and spatial design, coherence of strategy, representation)
- 20% Individual contribution within the group (quantitative rigor, specific deliverables, engagement)
- 20% Oral presentations and reviews (clarity, argumentation, critical positioning)

Resources

Moodle Link

- https://go.epfl.ch/URB-420