

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	Social Sciences		
<b>ACADEMIC UNIT</b>	Department of Cultural Technology and Communication		
<b>LEVEL OF STUDIES</b>	Postgraduate Studies		
<b>COURSE CODE</b>	UA-EC5	<b>SEMESTER</b>	2
<b>COURSE TITLE</b>	Smart, Circular and Resilient Cities and Regions		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, state the weekly teaching hours and the total credits</i>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail in section (4).</i>	3	6	
<b>COURSE TYPE</b> <i>general background, special background, specialization, general education, skills development</i>	specialised (technical)	general	knowledge, skills development
<b>PREREQUISITE COURSES</b>	No		
<b>LANGUAGE OF INSTRUCTION AND OF ASSESSMENT</b>	English		
<b>MODE OF TEACHING</b> <i>in-person (%) synchronous distance learning (%) asynchronous distance learning (%) (In the case of synchronous distance learning, the total weekly duration of teaching is recorded)</i>	The course is delivered exclusively through synchronous distance learning.  Each weekly lecture lasts 180 minutes.		
<b>AVAILABILITY TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEBSITE (URL)</b>	TBA		

### (2) LEARNING OUTCOMES

<p><b>Learning Outcomes</b></p> <p><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> <li>• <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i></li> <li>• <i>Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i></li> <li>• <i>Brief Guide for drafting Learning Outcomes</i></li> </ul>
<p>After the successful completion of the course, the student will be able to:</p> <p>In terms of knowledge:</p> <ul style="list-style-type: none"> <li>• Critically evaluate the conceptual foundations of smart, circular and resilient cities and regions, and explain how digital, environmental, social and governance components intersect in contemporary territorial transitions.</li> <li>• Analyse how IoT, AI, data-analytics platforms, digital twins, and urban-intelligence systems optimise urban resource use, support circular flows and strengthen resilience.</li> <li>• Demonstrate advanced understanding of urban metabolism, resource-flow mapping, circular-indicator systems and monitoring frameworks used in evidence-based urban planning.</li> <li>• Explain how EU strategies, policy frameworks, governance models and financial mechanisms enable smart, circular and resilient territorial development.</li> </ul>

- Evaluate governance arrangements, stakeholder networks, and community-engagement models required to manage circular and resilient transitions across regional scales.

In terms of skills:

- Design integrated strategies for cities and regions that combine circular-economy approaches, digital infrastructures, climate-resilience measures and inclusive governance models.
- Apply urban-analytics tools (resource-flow mapping, digital twins, predictive analytics, IoT insights) to diagnose system inefficiencies and propose circular solutions.
- Integrate technical, environmental, social and economic datasets to support scenario analysis, resilience planning and smart-city decision-making.
- Assess the suitability of circular and resilience indicators for different territorial contexts and justify data-informed planning recommendations.

In terms of responsibility and autonomy:

- Lead strategic innovation processes guiding the transition toward smart, circular and resilient cities, managing multi-sectoral and multi-actor collaboration under conditions of uncertainty.
- Take responsibility for ethical, inclusive, and sustainability-driven decision-making in urban digitalisation, community engagement and resource-management processes.
- Manage cross-disciplinary projects involving digital infrastructures, circular-economy planning, resilience design and territorial governance frameworks.
- Exercise critical judgement in balancing technological, social, environmental and financial considerations when designing circular and resilient urban systems.
- Synthesise course concepts to propose future-oriented pathways for digitally enabled, inclusive, circular and climate-resilient territorial development.

#### General Competences

*Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and are stated below), at which of the following does the course aim?*

<i>Search, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adaptability to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Other...</i>
	<i>.....</i>

The current module will enable students to acquire the following competencies:

- The ability to understand and critically evaluate how digitalization, circular economy principles, and resilience strategies interact in shaping future cities and regions.
- Responsible, and sustainability-oriented decision-making grounded in an understanding of urban resource flows, climate adaptation needs, and social inclusion.
- Capacity to interpret and use data, digital tools (IoT, digital twins, analytics), and monitoring frameworks to support evidence-based urban and regional planning.
- Skills to work collaboratively in multidisciplinary, multi-stakeholder settings, engaging with governance models, cross-sector synergies, and participatory processes that support circular and resilient territorial development.

These competences will be acquired thanks to the wide range of topics addressed—from digital infrastructures and ecosystem mapping to governance, finance, and climate-adaptive design—and through the team-based exercises that simulate real urban and regional transition challenges.

### (3) COURSE SYLLABUS

**UA-EC5: Smart, Circular and Resilient Cities and Regions** explores how digital technologies can be used to build smart, circular, and resilient urban and regional environments. Students will learn about the role of IoT, AI, and data analytics in optimising urban resources, improving waste management,

and enhancing the resilience of cities to future challenges such as climate change and resource depletion.

The course consists of 13 lectures, as presented below:

1. **Introduction to Smart, Circular and Resilient Cities and Regions (Instructor: UNL).** This lecture introduces the concept of smart, circular and resilient cities and regions, linking digitalization, sustainability, and governance in territorial systems.
2. **Urban Circularity: Principles, Frameworks and Planning Approaches (Instructor: ASF).** This lecture explores how circular economy principles can be systematically applied to urban systems. Participants will examine the foundational concepts of urban circularity and their practical implementation through integrated planning approaches. The session progresses from understanding core circular economy principles within city contexts, to exploring the social and behavioural dimensions that shape resource flows and consumption patterns, before addressing waste management and resource recovery strategies. Through this progression, students will develop critical understanding of how circularity can be embedded into city planning and identify concrete applications within their own urban contexts.
3. **The Digital Backbone of Circular Cities: Data, IoT and Urban Intelligence (Instructor: ASF).** This lecture explores how digital infrastructures such as IoT networks and urban data platforms enable circular city operations and monitoring.
4. **Architecture and smart cities for the 21st century (Instructor: UMA).** This lecture will address the theoretical concept of smart cities from the perspective of architecture and urban planning. Current examples of smart architectural spaces created by architects will be presented.
5. **Urban Resource Flow Mapping and Material Circularity (Instructor: IETU).** This lecture will present tools and methodologies for mapping material and resource flows within cities to identify circular opportunities. This lecture will examine the role of digital tools and analytical frameworks in supporting smart and circular urban development. It will provide an overview of how cities collect, interpret, and apply data in decision-making processes, considering the organizational, social, and technological conditions that influence implementation.
6. **Systems Design for Circular and Resilient Cities (Instructor: EGC).** This lecture introduces systems thinking as a framework for designing cities that operate within planetary boundaries. Drawing on Design in the Anthropocene and Systems Design in the Anthropocene, it explores how digital infrastructures can help cities measure, manage, and minimise their ecological impact while enhancing social well-being. Students will learn how data-driven feedback loops, life-cycle accounting, and cross-sectoral digital platforms can support circular resource flows in urban systems. Through examples from energy, materials, and waste cycles, the lecture connects theoretical models to real-world applications of AI and IoT for resource optimisation and resilience planning.
7. **Mapping Circular Ecosystems for Smart, Circular and Resilient Cities and Regions (Instructor: SmartUse).** This lecture introduces circular economy ecosystem mapping using the Circular Regions platform, with Nordic city–region examples. It shows how a holistic framework that includes environmental, economic and social dimensions can help cities and regions in both the Global North and Global South understand existing circular activities, identify gaps, and explore sector-specific transitions and cross-sector synergies across urban and rural areas.
8. **Designing Resilient Urban Infrastructure, Smart Mobility & Logistics to Mitigate Climate Change (Instructor: DBL).** This lecture examines how cities can enhance resilience, through adaptive infrastructure design, integration of smart mobility and logistics solutions. The lecture provides insight into how resource-efficient planning, digital technologies and circular systems reduce emissions, improve accessibility and strengthen the resilience of developing & developed urban environments.
9. **Indicators and Monitoring Frameworks for Circular and Smart Cities (Instructor: UM).** This lecture reviews existing indicator systems and monitoring frameworks for assessing circularity and resilience in cities.

10. **Policy, Regulation and EU Strategies for Smart Circular Regions (Instructor: IETU).** This lecture provides an overview of EU policies and frameworks, relevant directives, initiatives and regional strategies that support smart and circular territorial development. Key principles for their implementation will be discussed. Analysis of their role in fostering innovation, cross-border cooperation, and integrated governance approaches across urban and regional scales will be carried out.
11. **Financing Urban Circular and Resilient Transitions (Instructor: IETU).** This lecture examines financial models and investment mechanisms that enable cities to fund circular and resilience projects.
12. **Governance and Multi-Stakeholder Collaboration in Circular Regions (Instructor: IETU).** This lecture discusses governance models and multi-stakeholder cooperation necessary for managing circular and resilient urban regions. The practical examples of governance models developed in EU cities based on establishing participatory, cross-sector frameworks will be presented and analysed. The interactive exercises encouraging students to explore how different actors collaborate, negotiate, and make decisions in circular and resilient urban systems will be carried out.
13. **Future Pathways: Digital and Inclusive Governance for Circularity (Instructor: IETU).** This lecture synthesises digital, social, and governance perspectives to outline future directions for inclusive, data-driven circular territories. Students will learn about actionable strategies that combine digital technologies (like IoT, big data) and inclusive governance (collaborative, transparent, and citizen-engaging processes).

#### (4) TEACHING AND LEARNING METHODS - ASSESSMENT

<b>MODE OF TEACHING</b> <i>Face-to-face, distance learning, etc.</i>	Distance Learning	
<b>MODE AND FREQUENCY OF COMMUNICATION WITH THE STUDENTS</b>	Synchronous distance communication on a weekly basis, asynchronous on a daily basis through LMS platform	
<b>ENSURING THE MODE OF COMMUNICATION AMONG STUDENTS</b> <i>Team assignments and discussions, collaborative learning platforms with the use of AI, video conference, QA sessions, κ.α.</i>	Weekly assignments, discussions through dedicated discussion forum, dedicated space per module on the learning platform, schedule video conference meetings through MS Teams, dedicated QA sessions per module	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, in laboratory training, in the communication with students</i>	Use of ICT in Teaching, Communication with students Online Platforms will be used for teaching, tutorials, students' guidance, students' self-assessment and support on group projects	
<b>TECHNOLOGICAL EQUIPMENT REQUIREMENTS</b>	PC /laptop for video conference meeting	
<b>PLAGIARISM POLICY/ PLAGIARISM DETECTION TOOLS</b>	Gradescope, Turnitin	
<b>ARTIFICIAL INTELLIGENCE POLICY</b> <i>(1) The use of Artificial Intelligence is prohibited in all circumstances</i> <i>(2) The use of Artificial Intelligence is allowed only with the permission of the instructor</i> <i>(3) The use of Artificial Intelligence is allowed only with an explicit reference to the literature</i> <i>(4) Students are free to use Artificial Intelligence</i>	The use of Artificial Intelligence is allowed only with an explicit reference to the literature. Additionally, students are free to use AI provided by the master programmes for contacting stimulations, practicing purposes, etc.	
<b>ORGANISATION OF TEACHING</b> <i>The mode and methods of teaching are described in detail.</i> <i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, work placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artworks, etc.</i>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	39
	Participation in forum discussions	16,5
	Study, analysis of bibliography and	73,5

<p><i>The student's study hours for each learning activity are stated, as well as the hours of independent study, according to the principles of the ECTS.</i></p>	supplementary consolidation activities	
	Self-Assessment Evaluations	21
	<b>Course total</b>	<b>150</b>
<p align="center"><b>STUDENT ASSESSMENT</b></p> <p><i>Description of the assessment method</i></p> <p><i>Language of assessment, methods of assessment, formative or summative assessment, multiple choice questions test, short answer questions, essay questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory assignment, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p>Students will be evaluated following multiple-choice, short-answer, and open-ended questions.</p> <p>The assessment formula is the following:</p> <p>Self-Assessment Evaluations: 50% Final Assessment: 50%</p>	

## (5) RECOMMENDED BIBLIOGRAPHY

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