COURSE OUTLINE

(1) GENERAL

SCHOOL	Social Sciences		
ACADEMIC UNIT	Department of Cultural Technology and Communication		
LEVEL OF STUDIES	Postgraduate Studies		
COURSE CODE	UA-MC1	**SEMESTER**	1
COURSE TITLE	Introduction to Digital Circular Economy		
INDEPENDENT TEACHING ACTIVITIES *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*		**WEEKLY TEACHING HOURS**	**CREDITS**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail in section (4).		3	8
COURSE TYPE *general background, special background, specialization, general education, skills development*	General background		
PREREQUISITE COURSES	No		
LANGUAGE OF INSTRUCTION AND OF ASSESSMENT	English		
MODE OF TEACHING *in-person (%) synchronous distance learning (%) asynchronous distance learning (%) (In the case of synchronous distance learning, the total weekly duration of teaching is recorded)*	The course is delivered exclusively through synchronous distance learning. Each weekly lecture lasts 180 minutes.		
AVAILABILITY TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	TBA		

(2) LEARNING OUTCOMES

Learning Outcomes

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.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Brief Guide for drafting Learning Outcomes*

After the successful completion of the course, the student will be able to:

In terms of knowledge:

- Critically evaluate the historical evolution, principles and pillars of the circular economy, relating them to current sustainable development frameworks across nano–meta levels.
- Synthesise political, social and legal perspectives that shape circular transitions, identifying the implications for global governance and social inclusion.
- Demonstrate advanced understanding of digital technologies (IoT, AI, Big Data, Digital Product Passports) and their role in enabling circular strategies and business models.
- Critically evaluate international and EU circular economy metrics and monitoring frameworks and compare their applicability at micro, meso and macro levels.

- Demonstrate an understanding of the ethical, ecological and data protection (GDPR) principles relevant to digital circular ecosystems, highlighting the associated risks, responsibilities and societal implications.
- Analyse complex industrial systems (textile, construction, food, manufacturing) to identify opportunities for circularity, waste prevention, and resource optimisation.

In terms of skills:

- Design data-driven strategies for enabling circular transitions, integrating digital technologies, advanced data-management practices, and evidence from circularity-readiness assessments.
- Apply systems-thinking and resource-nexus analysis to diagnose interdependencies and propose interventions for circular ecosystem optimisation.
- Apply readiness-assessment frameworks to critically examine the societal conditions influencing the adoption of circular innovations and develop strategies for accelerating inclusive and responsible uptake.
- Frame circular-economy interventions by articulating how relational and reciprocal worldviews can reshape long-term sustainability decisions.
- Critically assess data-sharing processes and digital governance structures, identifying compliance gaps and recommending GDPR-aligned solutions.
- Develop speculative design scenarios that explore future circular job roles, work practices, and socio-technical systems using design fiction methodologies.

In terms of responsibility and autonomy:

- Guide the development of strategic circular economy initiatives, integrating socio-political, ecological, regulatory and digital considerations, and demonstrating sound judgement in ambiguous, multi-stakeholder contexts.
- Exercise ethical and professional responsibility by critically evaluating the societal implications, risks and inclusivity of digital circular transitions and defending decisions that prioritise long-term public and ecological value.
- Integrate technological, ecological, social and economic evidence to design coherent action pathways that address complex circularity challenges at micro–macro scales.
- Encourage the responsible use of digital technologies, data and AI within circular systems by establishing transparent, GDPR-compliant and socially accountable data-driven decision-making practices.

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?

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

The current course will enable students to acquire the following competences:

- Ethical, responsible, and sustainable decision-making in business contexts, as UA-MC1 emphasises on the ethical use of digital technologies, GDPR, societal readiness, political and ecological implications of circular transitions, and legal-oriented approaches.
- Strategic and innovative thinking for managerial problem-solving, as the course requires students to be able to drive strategic circular initiatives, integrate multiple knowledge domains, and manage circular transitions.
- Search for, analysis and synthesis of data and information, with the use of the necessary technology, as digital circular economy is data-driven.
- Working in an interdisciplinary environment, as UA-MC1 integrates political science, ecology, engineering, data governance, digital technologies, and management.
- Respect for the natural environment, which is central to circular economy foundations,

ecological thought, sustainability, societal readiness, resource optimisation, and resilience.

(3) COURSE SYLLABUS

UA-MC1: Introduction to Digital Circular Economy is a foundational course that introduces students to the principles of circular economy and the role of digital technologies in driving sustainable growth. It explores how digital transformation supports circular systems, resource optimisation, and sustainable development, with a focus on the move from linear to circular systems and the benefits of digital tools in this transition.

The course consists of 13 lectures, as presented below:

1. **Introduction on Circular Economy as a driver towards sustainable development (instructors: POLIMI/SmartUse).** This lecture introduces the key characteristics, history, principles, and pillars of the circular economy paradigm and its business models. It also presents the ReSOLVE framework and the Circular Regions platform as tools for classifying circular business models.
2. **Circular Economy adoption at nano, micro, meso and macro, meta level: practices and industrial cases (instructor: POLIMI).** This lecture outlines circular economy strategies across organisational and ecosystem scales, from products and processes to networks and regions. Industrial cases illustrate how circularity unfolds from the micro to the macro level.
3. **Political and social stakes of the circular economy and sustainability (instructor: TUDO).** This lecture examines the circular economy as a political and social project shaped by power, inequality, and governance. It highlights how circular transitions can reinforce or challenge global hierarchies while identifying justice-oriented approaches.
4. **Internet of Things (IoT) in the Circular Economy (Instructor: UiO).** This lecture explores the role of the Internet of Things (IoT) in advancing the Circular Economy. Students will learn how IoT technologies enable resource efficiency, waste reduction, and sustainable production systems. Topics include smart materials tracking and data-driven circular business models promoting sustainability and innovation.
5. **Resources optimization for circular ecosystems (instructor: ZELUS).** This lecture introduces prevention- and mitigation-based approaches to waste reduction using product design, behaviour change, and recovery technologies. Examples from textile and food sectors illustrate systems thinking and resource-nexus optimisation.
6. **Circular transition in key sectors: industrial practices, case studies and societal readiness levels (instructor: SmartUse).** This lecture presents case studies from multiple sectors through the Circular Regions platform, highlighting impacts, barriers, and enablers of circular transitions. Societal Readiness Levels (SRL) are introduced as a tool for assessing adoption across regions.
7. **Monitoring and assessing the performances: the circular transition metrics (Instructor: UM).** This lecture reviews major frameworks for assessing circular economy performance at micro, meso, and macro levels, including OECD, CTI, the Circularity Metrics Lab, and the EU Circular Economy Monitoring Framework and EU monitoring initiatives. Students compare their scope and learn how these tools inform policies and business metrics.
8. **Exploring operational and information technologies for boosting the circular transition (Instructor: WU).** This lecture introduces several technological opportunities for Circular Transition, mainly with Big Data, IoT, and AI. Students will learn the mentioned concepts and methods to apply in an operational context. We introduce case studies as hands-on practical on farming profit data and AI for sustainable futures.
9. **Valorising data usage to boost the circular transition (Instructor: e-Circular).** This lecture introduces the fundamentals of enterprise and supply chain data management, including processes, tools and techniques, to facilitate circularity transition. Use cases such as data sharing through the form of Digital Product Passports are discussed. Students will also learn the implications and implementations of a transformational data project.
10. **The use of digital tools for circularity readiness assessment of industries (Instructor: DTU).** This lecture will introduce the concept of circularity readiness; The lecture will take

place in an interactive manner, with the demonstration of the concept and use of the ready2Loop Digital platform for supporting circularity readiness assessment and circularity transition of industries.

11. **Introduction to GDPR basic principles (Instructor: UAEGEAN).** This lecture will be dedicated to the introduction to basic principles for data protection and GDPR compliance. Students will learn the concept of privacy in digital era, how to identify possible privacy incidents and when they should comply with the data protection regulation.
12. **Job profiles and work practices to embrace the circular principles based on speculative design (Instructor: TUDO).** This lecture uses speculative design to explore future circular job roles, work practices, and socio-technical systems. Through collaborative scenarios, students imagine how technological and cultural shifts could shape regenerative work environments.
13. **Ecological thought: Thinking beyond anthropocentrism and nature (Instructor: TUDO).** This lecture challenges anthropocentric assumptions underpinning economic and technological systems by drawing on ecological and relational philosophies. Students develop ecological literacy and reconceptualise circularity as a condition of interdependence and reciprocity.

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

MODE OF TEACHING *Face-to-face, distance learning, etc.*	Distance Learning
MODE AND FREQUENCY OF COMMUNICATION WITH THE STUDENTS	Synchronous distance communication on a weekly basis, asynchronous on a daily basis through LMS platform
ENSURING THE MODE OF COMMUNICATION AMONG STUDENTS *Team assignments and discussions, collaborative learning platforms with the use of AI, video conference, QA sessions, κ.α.*	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
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, in laboratory training, in the communication with students*	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
TECHNOLOGICAL EQUIPMENT REQUIREMENTS	PC /laptop for video conference meeting
PLAGIARISM POLICY/ PLAGIARISM DETECTION TOOLS	Gradescope, Turnitin
ARTIFICIAL INTELLIGENCE POLICY *(1) The use of Artificial Intelligence is prohibited in all circumstances* *(2) The use of Artificial Intelligence is allowed only with the permission of the instructor* *(3) The use of Artificial Intelligence is allowed only with an explicit reference to the literature* *(4) Students are free to use Artificial Intelligence*	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.
ORGANISATION OF TEACHING *The mode and methods of teaching are described in detail.* *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.* *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.*	

Activity	***Semester workload***
Lectures	39
Participation in forum discussions	20
Study, analysis of bibliography and supplementary consolidation activities	111
Self-Assessment Evaluations	30
Course total	**200**

STUDENT ASSESSMENT *Description of the assessment method* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Students will be evaluated following multiple-choice, short-answer, and open-ended questions. The assessment formula is the following: Self-Assessment Evaluations: 50% Final Assessment: 50%

(5) RECOMMENDED BIBLIOGRAPHY

Suggested bibliography

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[13] H. M. Logan, V. Rossi, K. K. Hansen, M. Z. Søndergaard, and A. Damgaard, “Assessing the circularity potential of textile flows for future markets in Denmark: A study of textile anatomy,” Sustainable Production and Consumption, vol. 59, pp. 127–142, 2025, doi: 10.1016/j.spc.2025.08.002.
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[15] G. Ojeda-Matos and J. L. Jones-Crank, “The potential of the water-energy-food nexus approach in advancing the sustainable development goals: A PRISMA-based systematic review,” Environmental Science & Policy, vol. 163, p. 103961, 2025, doi: 10.1016/j.envsci.2024.103961.
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