University of Gdańsk

Subject card

Subject name and code	Digital transformation for the environment , PG_00199005		
Field of study	Economics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	4.0
Learning profile	academic	Assessment form	credit
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Maria Matusiewicz	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	10.0	0.0	40

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	40	0.0	60.0	100

Subject objectives

The aim of the lectures is to familiarize students with theoretical and systemic aspects of digital transformation in the context of environmental protection and sustainable development. The subject shows the role of digital technologies (such as big data, artificial intelligence, IoT or blockchain) in diagnosing, monitoring and solving environmental problems at the local and global level. The lectures also analyze the ethical, social and institutional challenges accompanying digitalization in an environmental perspective.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[EKONL3_W06] has an advanced knowledge of selected methods and tools, including statistical and econometric techniques, for describing economic agents and structures as well as social institutions and the processes taking place in them	The student knows data analysis methods and tools used to describe digitalization phenomena and their impact on the environment and social and economic institutions.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[EKONL3_U02] is able to use the knowledge of theory and data to analyse concrete economic and social processes and phenomena and to analyse these phenomena using methods developed in economics, finance and management sciences	The student is able to use theoretical knowledge and available data to analyze the impact of digital solutions on environmental and social processes.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[EKONL3_K05] correctly identifies, diagnoses and resolves professional dilemmas and different options for solutions	The student is able to recognize and analyze dilemmas related to the use of digital technologies in the environmental context and evaluate alternative approaches to solving them.	[SK2] presentation/project/paper/ report [SK4] test/exam - oral or written
[EKONL3_K03] participates in the preparation of economic and social projects, being able to reconcile legal, economic, ecological, political and social requirements	The student is able to participate in the preparation of solutions and analyses regarding digital transformation, taking into account ecological, economic and social aspects.	[SK2] presentation/project/paper/ report [SK4] test/exam - oral or written
[EKONL3_W08] has an advanced knowledge of the processes of changing elements, enterprises and whole structures of economic organisations, as well as the processes of changing social institutions, knows what their causes, course, scale, consequences are and what the influence of external stakeholders is on them	The student has knowledge of organizational and institutional changes related to the implementation of digital solutions supporting sustainable development and understands their social and economic consequences.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[EKONL3_U03] is able to analyse the causes and course of specific economic and social processes and phenomena, and accurately analyse these phenomena using adequate methods and tools economic and social	The student is able to analyze the causes and course of phenomena related to digital transformation in the environmental context, using appropriate analytical tools.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written

Subject contents

Introduction to digital transformation
definitions, scope, main technologies (ICT, AI, IoT, big data, blockchain); relationship with social and economic transformation.
Digital transformation and environment relationships and tensions
impact of technology on the natural environment (positive and negative); the concept of green digital transformation.
Digital transformation in environmental policies (EU, UN, national)
the European Green Deal strategy, Agenda 2030, ESG and the role of data in environmental reporting.
Smart cities and urban infrastructure in the age of digitalization
energy, water, mobility and waste management; predictive systems and automation.
Digital technologies in the circular economy (CE)
product life cycle tracking, digital product passports, reverse logistics.
Environmental management using big data and AI
early warning systems, predictive models, remote monitoring of ecosystems.
Digital transformation in high-emission sectors
agriculture, industry, transport: application examples and limitations.
Sustainable ICT environmental challenges of digital transformation
carbon footprint of data centers, energy consumption, e-waste, energy intensity of AI.
The role of states, local governments, companies and citizens in digital environmental transformation
cooperation models, institutional frameworks, digital participation.
The future of digital environmental transformation
development scenarios, technological innovations and adaptation to climate change.

Students prepare a project in teams covering the above-mentioned topics, which is discussed and approved during consultations with the lecturer and then presented in class.

Prerequisites and co-requisites

passing the subject exercises

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>developing a project topic selected in consultation with the lecturer and presenting it during classes</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>an exam in the form of open and closed questions</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>• European Commission. (2020). Shaping Europes Digital Future. [Dostęp online: https://digital-strategy.ec.europa.eu] oficjalny dokument UE dotyczący cyfrowej transformacji z odniesieniami do środowiska i zrównoważonego rozwoju.
• World Economic Forum. (2021). Digital Transformation: Powering the Green Economy. raport opisujący, jak transformacja cyfrowa wspiera cele środowiskowe, zwłaszcza w przemyśle i miastach.</td></tr>
<tr><td>Supplementary literature</td><td>OECD, Digitalisation and the Environment: Opportunities and Challenges, https://www.oecd.org/en/topics/digitalisation-and-the-environment.html</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">What are the greatest opportunities and threats related to digital transformation for the environment?
- analysis of case studies (e.g. digital twin cities, remote air monitoring, e-waste).
Do digital technologies really support sustainable development or do they just sell green?
- group work: comparison of examples of greenwashing vs. green tech.
How can cities use data to improve the quality of the environment?
- development of the concept of smart solutions for transport, energy or waste management.
Digital carbon footprints - is digitalization climate neutral?
- analysis of data on emissions from data centers, cryptocurrencies, streaming, AI.
What role can citizens play in digital environmental protection?
- review of applications, crowdsourcing of environmental data, online participation.
Green deal and digital transformation - which priorities support each other and where are the conflicts?
- work with EU documents: identification of synergies and tensions.
How can the Internet of Things (IoT) support environmental monitoring?
- Mini-project: Propose an application of IoT in a specific context (e.g. water quality, urban heat islands).
Circular economy and digital technologies - analysis of dependencies.
- Task: How can digital product passports affect production and recycling?
Can digital spatial planning tools support adaptation to climate change?
- Assessment of examples of the use of spatial data and predictive models.
What digital competences are needed by future environmental specialists?
- Discussion: What is missing in environmental education in the face of digital challenges?</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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