Warsaw University of Technology

COURSE OFFERED IN THE DOCTORAL SCHOOL

Code of the course	4606-ES-00000FI-0049	Name of the course	Polish	**Panel kontrolny gospodarki obiegu zamkniętego**
			English	**Dashboard in circular economy**
Type of the course	specialty subjects			
Course coordinator	Prof. dr hab. inż. Małgorzata Kacprzak			
Implementing unit		Scientific discipline / disciplines*	environmental engineering, mining and energy; civil engineering	
Level of education	Education of doctoral students	Semester	~~Winter~~/summer	
Language of the course	English			
Type of assessment:	passing	Number of hours in a semester	30	ECTS credits: 2
Minimum number of participants	12	Maximum number of participants		Available for students (BSc, MSc): Yes/No

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week	2				
	in a semester	30				

* does not apply to the Researcher's Workshop

1. Prerequisites

Students have basic knowledge of chemistry, ecology, environmental protection, materials management and economics. Subject realized in a hybrid form.

2. Course objectives

The aim of the course is to provide knowledge about important aspects of the circular economy concept - about challenges, barriers and limitations. Currently, economic growth depends primarily on increased consumption. In this linear economic approach, companies collect or extract materials, use them to grow or manufacture products, and then sell those products to consumers who typically incinerate or landfill materials that no longer serve their original purpose. As the human population grows and resources become more and more limited, this waste management model becomes unsustainable. The circular economy, on the other hand, is an economy that "recreates and regenerates by design, and its goal is to keep products, components and materials at their highest utility and value at all times" (Ellen MacArthur Foundation, 2013). When the words "circular economy", "technology", "environment" and "digital tool" are combined, the first thing that often comes to mind is "dashboard". Hence, another goal of the subject is to develop an assumption for a dashboard that shows how well people are doing in the circular economy by multiple areas and indicators. A dashboard that can help you discover the possibilities of circular technologies and follow the progress of their implementation without compromising the quality of the environment. And answer the question of how the circular economy concept can contribute to solving the current environmental and technological challenges related to the use of global resources and waste management.

3. Course content (separate for each type of classes)

Lecture

1. *What is the circular economy? – listen Ellen Macarthur*
2. *Cradle to cradle – myth or reality?*
3. *Systemic approach to circular economy*
4. *Circular economy and circular supply chains*
5. *Busines value in circular economy*
6. *Renewable energy*
7. *Cities and the circular economy*
8. *Industrial manufacturing*
9. *Environmental impact (climate, LCA, carbon foot, toxicology)*
10. *Consumers view (food & agriculture, fashion & textiles, consumer electricals & electronics, packaging & plastics)*

11. Law and ethics (accelerator or brake) *12. Remanufacturing – second life of products in micro-scale* *13. Follow your iphone - sustainable maining* 14. *Digital for sustainability – IoT for circular economy*
Laboratory

4. Learning outcomes			
	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
W01	*Student is able to explain the concept of circular economy and understand its role in sustainable development.*	SD_W1	Test/quizz
W02	*The student knows and understands the interdisciplinary measures (especially the control panel) used to reduce the impact of current environmental challenges related to the use of important global resources and waste management in accordance with the circular economy.*	SD_W3	Test/quizz
W03	*The student knows and understands the non-technological aspects of the circular economy, especially economic, legal, ethical and other important requirements*	SD_W4	Test/quizz
Skills			
U01	*The student is able to use an inderdisciplinary approach to circular economy in relation to a specific stream of materials and services*	SD_U1	Test/quizz
U02	*The student is able to make a critical analysis and evaluation of individual stages of the designed method of management in accordance with the circular economy, in particular to assess the usefulness and possibility of using in practice the "control panel"*	SD_U2	Test/quizz
U03	*The student is able to use specialist English during the discussion on the subject of circular economy, maintaining an interdisciplinary approach*	SD_U6	Activity estimation during lectures
Social competences			
K01	*The student recognizes the importance of knowledge from various disciplines (engineering and technical sciences, social sciences, humanities, economics) and the need to apply scientific achievements in solving cognitive and practical problems in an economy conducted in accordance with the principles of circular economy*	SD_K2	activity estimation during lectures

*Allowed learning outcomes verification methods: exam; oral exam; written test; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
Tests in the form of a "quiz" after the every lecture

Assessment of activity during classes

6. Literature
Basic literature: [1] https://ellenmacarthurfoundation.org/resources/education-and-learning/circular-economy-courses [2] Braungart M., McDonough W. 2002. Cradle to Cradle: Remaking the Way We Make Things Paperback, North Point Press [3] Meadows D.H. Wright D. 2008. Thinking in Systems: International Bestseller Paperback – Illustrated, Chelsea Green Publishing [4] https://circularclassroom.com/ Supplementary literature: [1] Bakker C., den Hollander M. 2020. Products that Last: Product Design for Circular Business Models. BIS Publishers [2] Charter M. 2018. Designing for the Circular Economy 1st Edition, Routledge

7. PhD student's workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	30
2	Hours of consultations with the academic teacher, exams, tests, etc.	10
3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	15
4	Amount of time devoted to the preparation for exams, test, assessments	15
	Total number of hours	**70**
	ECTS credits	**2**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)