

<b>Module: New materials and biomaterials</b>					
<b>Course: Plastic packaging in the context of development of new materials and biobased materials technology</b>					
<b>Educational profile: general</b>					
<b>ECTS points 2</b>					
<b>Education level: 5 EQF</b>					
<b>Prerequisites</b>	Secondary education Knowledge of the basics of natural sciences				
<b>Target group</b>	A course dedicated to people who want to gain and deepen their knowledge of the possibilities of using innovative materials, including biomaterials in the plastic packaging industry in the context of the development of the circular economy.				
<b>CLASS LANGUAGE</b>	ENGLISH				
<b>LECTURER</b>	Małgorzata Bajer, Agnieszka Cholewa-Wójcik, Agnieszka Czaplicka-Kotas, Anna Dubel, Agnieszka Kawecka, Joanna Kulczycka, Ewelina Pędziwiatr				
<b>Number of hours of classes within individual forms of classes</b>	Lectures	Classes	Workshops	Project	Laboratories
	4	16			
<b>COURSE OBJECTIVES</b>	<p>C1. Acquiring knowledge of facts and theories concerning the circular economy with particular emphasis on the role and importance of the properties of packaging materials and packaging intended for contact with food.</p> <p>C2. Acquiring the ability to analyze and evaluate the available packaging materials for the production of packaging, including packaging intended for contact with food with special regards to legal requirements.</p> <p>C3. Developing the ability to use management tools for implementation of CE</p>				
<b>Reference to learning outcomes</b>	<b>Description of learning outcomes</b>			<b>Verification of learning outcomes</b>	

Knowledge		
<b>PPC_K01</b>	The student knows elected facts and theories in the field of economic and financial efficiency analysis of the new biomaterials in the plastic packaging industry	Task
<b>PPC_K02</b>	The student understands the role and importance of packaging materials for the production of packaging, including packaging intended for contact with food.	Task
<b>PPC_K03</b>	The student understands physico-mechanical and chemical properties of packaging materials and their influence on their use for packaging purposes.	Task
<b>PPC_K04</b>	The students know management tools for implementation of CE	Task
<b>PPC_K05</b>	The students know the examples of tools for assessment of circular economy and eco-innovation activities	Test
<b>PPC_K06</b>	The student has knowledge of indicators for financial efficiency, their meaning and practical usage in enterprises	Task
<b>PPC_K07</b>	The student can identify indicators for environmental effects	Task
Skills		
<b>PPC_S01</b>	The student can characterize: Resolve Model, Industrial Symbiosis and 3 layer BMC model.	Practical task
<b>PPC_S02</b>	The student can analyze and evaluate the available packaging materials for the production of packaging, including packaging intended for contact with food.	Practical task
<b>PPC_S03</b>	The student can on the basis of the analysis of the physico-mechanical and chemical properties of the materials, select the appropriate packaging material to the features and properties of the packed product.	Practical task
<b>PPC_S04</b>	The student can use Design Thinking method for packaging development.	

<b>PPC_S05</b>	The student understands the importance of implementation of Good practices in eco-innovations	Practical Task
<b>PPC_S06</b>	The student can make a comparison of costs and environmental effects of various waste handling methods, such as: landfilling or recycling	Practical Task
<b>PPC_S07</b>	The student can use “The Resolve Model” as a practical tool for implementation of CE for development of plastic packing in the field of new materials and biomaterials	Practical Task
<b>Responsibility and autonomy</b>		
<b>PPC_C01</b>	The student is ready for critical assessment of knowledge in the field of food plastic packaging	Practical task
<b>PPC_C02</b>	The student understands the need for continuous updating of knowledge in the context of economic, social and technological changes in the field of the plastic packaging industry	Practical task
<b>PPC_C03</b>	The student is ready to take actions in the area related to plastic packaging sector, reducing the negative impact on the environment	Practical task
<b>PPC_C04</b>	The student can recognize the proper tools used in enterprise management which are environmentally friendly	Practical Task
<b>PPC_C05</b>	The student understands the importance of cooperation between enterprises operating in a profitable goal for industrial and social development while minimizing the consumption of resources	Practical Task
<b>Students' own workload (in didactic hours 1h did.=45 minutes)**</b>		
Participation in lectures	4	
Participation in classes	16	
Preparation to classes	8	
Preparation to lectures	5	
Preparation to an examination	5	

		Project tasks
10 Credit/examination others (indicate which) <b>TOTAL:</b> <b>ECTS points:</b>		2 0 <b>50</b> <b>2</b>
PREREQUISITES	Lectures	Classes
COURSE CONTENT	<ol style="list-style-type: none"> <li><b>Food packaging materials – regal requirements, properties of materials and their influence on the used for packaging purposes</b></li> <li><b>Economic and Financial efficiency analysis of the new biomaterials in the plastic packaging industry</b></li> <li><b>Eco-innovations in the new materials and biobased materials technology related to the plastic packaging</b></li> </ol>	<ol style="list-style-type: none"> <li><b>Management tools for implementation of CE for development of plastic packing in the field of new materials and biomaterials</b></li> <li><b>Case study of financial efficiency analysis of the new biomaterials</b></li> <li><b>Analysis and evaluation of packaging materials used for the production of packaging, including for contact with food</b></li> <li><b>Selection of appropriate packaging materials to the features and properties of the packed product</b></li> </ol>
LITERATURE (compulsory reading)	<ol style="list-style-type: none"> <li>Materials provided in Moodle</li> <li>Schoenmakere, M. D., Hoogeveen, Y., Gillabel, J., &amp; Manshoven, S. (2018). The circular economy and the bioeconomy-Partners in sustainability. European Environmental Agency.</li> <li>Law for Circular Economy, Chris Backers, Eleven International Publishing Utrecht 2017.</li> </ol>	

	<p>4. Packaging technology. Fundamental, materials, processes, ed by Anne Emblen, Henry Emblen, Woodhead Publishing Ltd 2012 (chosen chapters).</p>
<p><b>OPTIONAL LITERATURE</b> (including at least two items in English, either books or articles)</p>	<ol style="list-style-type: none"> <li>1. Bio-based materials for Food Packaging. Green and Sustainable Advanced Packaging Materials. Ed. By Shakeel Ahmed, Springer 2018.</li> <li>2. Packaging and Packaging Waste, <a href="https://ec.europa.eu/environment/waste/packaging/legis.htm">https://ec.europa.eu/environment/waste/packaging/legis.htm</a></li> </ol>
<p><b>SHORT BIO OF PERSONS WHO CONDUCT CLASSES, WHICH ARE RELATED TO THE MODULE SUBJECT</b></p>	<p>Agnieszka Cholewa-Wójcik- Ph.D., D.Sc., Eng,- Professor at the Department of Goods Packaging, College of Management and Quality Sciences, Institute of Quality Sciences and Product Management, Cracow University of Economics. Leader, chief Executive officer, consultant projects financed by the Minister of Science and Higher Education and the National Center for Research and Development, European Social Fund and HECAFS. The current scientific and research achievements include about 100 items. The most important publication is the monograph entitled "Packaging and its role in the design of an integrated product in terms of consumer needs and requirements", PTTŻ Scientific Publishing House, Cracow 2018. Expert in the field of packaging and storage of goods of the Polish Society of Commodity Science. A specialist in the field of packaging, entered in the list of court experts. Author of many opinions and expertises. She cooperates with domestic and international companies from the packaging industry. She is the member of program and technical council COBICO.</p> <p>MSc. Agnieszka Czaplicka - PhD candidate in AGH University of Science and Technology and Innovation Specialist in Highway to Technology and Innovation Institute interested in environmental management, circular economy, and environmental assessment tools. Experience in realization or participation as an expert in the EIT RawMaterials, NCBR, EIT InnoEnergy, Interreg, NAWA, and Erasmus + projects.</p> <p>DSc Anna Dubel (PhD in Economics, specialization Management) is an environmental economist, researcher and lecturer in the Department of Management at the AGH University of Science and Technology, cooperating with the European Commission, international and polish scientific institutes and non-profit organizations in implementation of scientific and applied projects related to environmental issues. For many years she has been devoting her research to environmental economics and management participating in and leading applied research concerning economic analysis and systems modelling in the field of natural resources management, climate change</p>

impacts and water management. She participated in the Climate-KIC Pioneers into Practice programme researching the drivers and instruments for green innovation in SMEs and start-ups in Poland and UK at the Birmingham Science Park of the Aston University.

Agnieszka Kawecka, PhD in economics in the field of commodity science (2011), academic lecturer with 15 years of experience. An expert on storage and packaging, invited to the conferences of the speaker and trainer. An author of several scientific articles and chapters in monographs. She is a member of the Polish Society of Commodity Science.

Joanna Kulczycka, Ph. D. Sc. is a professor in the Faculty of Management at the AGH University of Science and Technology, Director of the office of The Highway to Technology and Innovation Institute IATI - virtual institute, and President of the Waste Management and Recycling Cluster – Key National Clusters in Poland.

She is an author of over 300 publications (H-index 17 Scopus). These include the first book on LCA in Polish, the first Polish Minerals Yearbook, and the first book about critical raw materials in Poland, and she is also editor of several books concerning the circular economy in Poland. Her research experience stretches from the economics and management of industrial processes, mainly in the raw materials and recycling sectors, to CSR, to eco-innovation and to the circular economy.

Member of the UNEP Resource Panel, the European Circular Economy Stakeholder Platform (2017-2020), EU H2020 SC5 Advisory Group for Societal Challenge 5 'Climate Action, Environment, Resource Efficiency and Raw Materials (2014-2018)', EU EIT Raw Materials (operational group), and the Committee for the Sustainable Management of Raw Materials of the Polish Academy of Science. She has experience in the management and realisation of EU projects, from 5FP UE, H2020, Interreg, KIC Raw Materials, Era-min and in the organisation of many conferences and workshops.

MA Ewelina Pędziwiatr - PhD candidate in AGH University of Science and Technology, project management specialist, with experience of preparation and implementation of EU funded projects: regional, national, EIT RawMaterials, NAVA, Erasmus, Interreg for public institutions, HEI, local government units, SMEs and scientific institutions. Experienced in management of international partnership projects.

Expert and advisor to non-governmental organizations and SMEs operating in the field of culture and leisure industries as well as research and development in creating strategies, research on demand and environmental analyzes.

<b>TEACHING METHODS</b>	Lecture Team work Practical tasks
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	Case studies
<b>TEACHING AIDS</b>	Classes by supervising teachers Presentations Films Additional teaching materials
<b>FORM AND CONDITIONS OF ASSESSMENT</b>	Practical online tasks Project work in teams  The condition for completing the course is obtaining a positive grade in the test and tasks.