Module: New materials and biomaterials						
Course: New materials and bio-based materials in plastic packaging sector in the context of development of the CE						
Educational profile: general						
ECTS points 3						
Education level: 5 EQF						
Prerequisites	Secondary education Knowledge of the basics of natural sciences					
Target group	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					
CLASS LANGUAGE	ENGLISH					
LECTURER	Agnieszka Cholewa-Wójcik, Anna Dubel, Ewelina Jamróz, Agnieszka Kawecka, Bartłomiej Kabaja, Marcin Łapaj, Justyna Muweis, Anna Sapota					
Number of hours of classes within individual forms of classes	Lectures	Class	Workshops	Seminar	Project	Laboratories
	10	20				
COURSE OBJECTIVES	C1. Acquiring knowledge of new materials and bio-materials as well as methods of their production and utilization, including their impact on the development of the circular economy. C2. Acquiring the ability to identify and characterize the properties of polymers (new and bio) as raw materials for the production of packaging materials. C3. Acquiring awareness of the impact of the use of biomaterials in the circular economy.					

Reference to learning outcomes	**Description of learning outcomes**	**Verification of learning outcomes**
Knowledge		
NBM_K01	Theoretical basis of knowledge about polymers as raw materials used in the production of packaging materials, including "new" and „bio”	Test

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NBM_K02	Scope of the legal aspects in the field of new materials and bio-based materials in packaging sector	Test
NBM_K03	Knows and understand the difference between linear and circular economy	Test
NBM_K04	Rules of certification and labeling of biomaterials	Task
NBM_K05	The effects of using biostrategies in the circular economy	Test
NBM_K06	Knows the examples of tools for monitoring of CE	Test
NBM_K07	Knows and can relate to the rules and development of legal regulations	Test
NBM_K08	Knows and understands the methods and techniques of materials and bio materials development in the plastic packaging sector	Test
Skills		
NBM_S01	Use knowledge of polymers (as raw materials for the production of packaging materials, including "new" and "bio")	Test
NBM_S02	Use knowledge of legal aspects in the field of new materials and bio-based materials in packaging sector	Task
NBM_S03	Can characterise main features of circular economy	Task
NBM_S04	Indicate the stages of the biomaterials certification process and identify the corresponding symbols	Task
NBM_S05	Evaluate the effects of the use of biostrategies in the circular economy and post-consumer waste management methods	Task
NBM_S06	Can analyze trends in the implementation of environmental strategies in the selected sectors and enterprises in EU	Task
NBM_S07	Can analyze the importance of new and biomaterials for CE development on the market	Task
NBM_S08	Can identify challenges of the CE policy implementation in the field of packaging in the international, national, regional, local level	Task
Responsibility and autonomy		

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NBM_C01	Critical assessment of the knowledge acquired in the field of new materials and biomaterials in the context of their use in the circular economy	Task
NBM_C02	Recognition of the importance of the latest knowledge in the field of material innovation in solving cognitive and practical problems in the area of circular economy	Task
NBM_C03	To think and act in an entrepreneurial manner and to initiate activities in the public interest, while showing concern for the environmental consequences of their professional activities.	Task
NBM_C04	Understands the the desirability of applying good practices (related to the adaption of the bioeconomy strategies in EU)being benefical for the environment and society	Task
NBM_C05	Importance of linear economy transition to the circular model as meeting the idea ofsustainable development which also has the impact on social competances	Task

Students' own workload (in didactic hours 1h did.=45 minutes)**

Participation in lectures	10
Participation in classes	20
Preparation to classes	10
Preparation to lectures	10
Preparation to an examination	11
Project tasks	10
Credit/examination	4
others (indicate which)	0
TOTAL:	**75**
ECTS points:	**3**

PREREQUISITES	Lectures	Classes
COURSE CONTENT	1. Bioeconomy strategy and legal aspects of use of new materials and bio-based materials in packaging sector 2. Characteristics of the principles of circular economy 3. Characteristics of polymers as raw materials used in the	1. Advantages and disadvantages of the use of new materials and bio-based materials in the context of development of the CE (economical aspects) 2. Adapting bioeconomy strategies in enterprises in selected courtiers of EU 3. Circular economy as a tool for

	production of packaging materials, including "new" and "bio" and production methods 4. Methods of recycling, recovery and reuse of bio-based materials. 5. Economic assessment and the value of bioplastic materials.	promotion biomaterials in the field of packaging - policy challenges in different region 4. Characteristics of biomaterials in plastic packaging sector 5. Certification and labelling – basic requirements and practise 6. Analysis of the rules of certification and labeling of biomaterials 7. Characteristics of new materials and biomaterials, and their types and use 8. Analysis of the suitability of materials for various forms of post-consumer packaging waste management. 9. Case study of chosen solutions on how to turn (bio)plastic wastes into assets for a company calculation 10. Willingness to pay
LITERATURE (compulsory reading)	1. Materials provided in Moodle 2. Handbook of Biopolymers and Biodegradable Plastics Plastics Design Library, ed. By Sina Ebnesajjad, 2013, ISBN: 9781455728343. 3. Packaging technology. Fundamental, materials, processes, ed by Anne Emblen, Henry Emblen, Woodhead Publishing Ltd 2012 (chosen chapters). 4. Handbook of Bio#Futures, Foreseeing and Exploring the Bioeconomy ed. by Emmanuel Koukios, Anna Sacio-Szymanska, 2021, ISBN: 978-3-030-64968-5 5. Schoenmakere, M. D., Hoogeveen, Y., Gillabel, J., & Manshoven, S. (2018). The circular economy and the bioeconomy-Partners in sustainability. European Environmental Agency.	

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SCHOLARLY BIOS	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. 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 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. Ewelina Jamróz, Ph.D., D.Sc., Eng.- scientific Lecturer at the Department of Chemistry, Faculty of Food Technology, University of Agriculture in Cracow, Poland. Her research interests are mainly towards the synthesis, characterization and application of biopolymer films and nanocapsules, especially based on polysaccharide-furcellaran, extracted from red algae Furcellaria lumbricalis. She extends her professional experience by leading research projects and giving many invited lectures.

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	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. Bartłomiej Kabaja - Ph.D. Eng. in Economics: An author of several scientific articles and chapters in monographs. A participant of many scientific conferences in Poland and abroad. A member of the Polish Logistics Association, Association of Polish Engineers and Technicians, and Polish Association of Commodity Science. He has been twice granted the Rector's Award (Cracow University of Economics) for individual scientific achievements. Scientific Interests: Theoretical and empirical study of the effectiveness of marketing communication, consumer satisfaction, neuromarketing. MSc. Eng. Natalia Kozik is a PhD candidate and a full-time faculty member in the Department of Packaging Science at the Cracow University of Economics, Poland. She is an author and co-author of several publications that deal mostly with the packaging role in the circular economy. She is a member of the Polish Society of Commodity Science. Justyna Muweis Ph.D. Assistant Professor at the Department of Strategic Management at the Faculty of Management of the AGH University of Science and Technology in Krakow. PhD in economics: economics and environmental management (Faculty of Economics at the University of Economics in Wrocław), graduate of the Faculty of Management at AGH (graduation with honors). Research interests: eco-innovations, ecologization of enterprise activity, environmental management, circular economy, corporate social responsibility, space debris, using of EU funds. Academic teacher of over 20 courses, author of over 40 publications in Polish and English, tutor of the Economics Science Club, AGH. Grants from: the Ministry of Science and Higher Education, Fondazzione ENI Enrico Mattei - Maria Curie program, International Society for Business Education. Organizations: European Association of Environmental and Resource Economists, The International Society for Business Education, Pack Alliance: European Alliance for Innovation Training & Collaboration Towards Future Packaging.

	Anna Sapota, Ph.D. – a lawyer with over 10 years of experience in advising Polish and foreign companies in business operations, for past 6 years with focus on environmental protection law and climate change regulations. Her doctoral degree in law was granted by Faculty of Law of Jagiellonian University in Krakow. Her private and professional interests are circular economy, sustainable production, zero-waste lifestyle.
TEACHING METHODS	Lecture Team work Practical tasks Case study Working with text Error identification
TEACHING AIDS	Presentations Films Additional teaching materials
FORM AND CONDITIONS OF ASSESSMENT	Test Practical tasks The condition for completing the course is obtaining a positive grade in the test and tasks.

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