



Subject card

Subject name and code	Processing Equipment, PG_00068919						
Field of study	Cosmetic technologies						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group		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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Katarzyna Januszewicz				
	Teachers		mgr inż. Paweł Rutecki dr hab. inż. Katarzyna Januszewicz dr inż. Anna Kuczyńska-Łażewska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	30.0	0.0	15.0	55
	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	55		6.0		39.0	100
Subject objectives	The aim of the course is to familiarize students with the design, operating principles, and applications of processing equipment used in cosmetic technology. The course develops the ability to select appropriate equipment according to the properties of raw materials and products and the required process parameters, with particular emphasis on mixing, homogenization, size reduction, separation, extraction of active ingredients, transport, and dosing.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W03] selects methods and processes for producing various forms of cosmetics		is aware of the equipment used in the cosmetics industry and is able to select the appropriate processing equipment and set its operating parameters for the production of various cosmetic products.		[SW3] Assessment of knowledge contained in written work and projects		
	[K6_W04] selects data analysis methods, including statistical, modeling and artificial intelligence, useful for solving technological and scientific problems in the field of cosmetic technology and related fields		is aware of analytical methods and is able to use them to evaluate the operating parameters and efficiency of processing equipment used in cosmetics technology.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture • Equipment for mixing, homogenization, and preparation of dispersed systems – types of mixers and agitators, homogenizers, basic operating parameters, and equipment selection criteria. • Equipment for size reduction, classification, and separation of materials – mills and grinders, sieves and screening equipment, filtration, centrifugation, and separation of bulk materials into particle-size fractions. • Equipment for the extraction and processing of cosmetic raw materials – extractors, distillation units, and oil presses. • Equipment for transport, dosing, filling, and packaging of cosmetic products – pumps, dosing and filling systems; influence of material properties on equipment selection. • Selection and integration of equipment in cosmetic production installations – selection of equipment according to the properties of raw materials and products, and analysis of selected technological process lines. Course content – laboratory • Occupational health and safety (OHS) and characteristics of processing equipment used in the cosmetics industry. Introduction to laboratory equipment and workstations. • Effect of agitator design and operating parameters on the mixing process. Comparison of propeller, paddle, and anchor agitators at different rotational speeds. Calculation of the mixing Reynolds number (Re). • Homogenizers in cosmetic technology – effect of homogenizer operating parameters. Homogenization at different rotational speeds and processing times. Comparison of mechanical mixing with rotor–stator homogenization. • Rheological characterization and stability assessment of dispersed systems. Viscosity measurements at different spindle speeds, microscopic observation of droplets, and accelerated stability testing using a centrifuge. Relationship between product properties and process parameters. • Size reduction and particle-size classification of raw materials used in cosmetic technology. Grinding of plant materials/oilseed press cakes followed by sieve analysis. Determination of particle-size fractions, grinding efficiency, and characteristic particle size. • Dispersion of a solid phase in liquid and semi-solid model media. Incorporation of a solid phase into media of different viscosities using an agitator/homogenizer. • Equipment for extraction and distillation of active ingredients. Operation of extraction, distillation, and filtration systems; production of extracts or essential oils from plant raw materials. • Mechanical extraction of oil from plant raw materials – characterization of the pressing process. Determination of oil extraction yield and process productivity. • Equipment for dosing, filling, and packaging of cosmetic products. Comparison of peristaltic, gear, and other available pump types for media of different viscosities. Course content – seminar Student presentations on the following topics: • Equipment for pressing plant oils used in cosmetic production. • Equipment for the extraction of active ingredients from plant biomass. • Distillation equipment for the production of essential oils and hydrosols. • Homogenizers and emulsifiers used in the production of cosmetic emulsions. • Process reactors and vacuum processing equipment in cosmetic technology. • Equipment for size reduction and micronization of cosmetic raw materials. • Equipment for filtration, clarification, and purification of cosmetic formulations. • Equipment for dosing, filling, and packaging of cosmetic products.
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	- Modern production lines for creams, lotions, and shampoos. - Automation and robotization of technological processes in the cosmetics industry.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	60.0%	30.0%
	Laboratory	60.0%	40.0%
	Seminars	60.0%	30.0%
Recommended reading	Basic literature	- Pikoń J., Aparatura chemiczna, PWN, Warszawa. - Koch R., Noworyta A., Procesy mechaniczne w inżynierii chemicznej, WNT, Warszawa. - Stręk F., Mieszanie i mieszalniki, WNT, Warszawa. - Synowiec P.M., Aparatura przemysłu chemicznego, WNT, Warszawa.	
	Supplementary literature	Malinowska P., Technologia kosmetyków , Wydawnictwo Politechniki Łódzkiej – jako pozycja uzupełniająca dotycząca specyfiki procesów kosmetycznych.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	- Selection and comparison of pumps for transporting liquids of different viscosities. - Analysis of operating parameters and performance of processing equipment. - Analysis of a technological process line and selection of appropriate processing equipment.		
Practical activities within the subject	Not applicable		

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