COURSE SYLLABUS

Course code	1070-ICGTE-MSA-203
Course name	Advanced Materials in Chemical Engineering
Course version	2026Z
Level of education	second cycle programme
Form and mode of study	full-time study
Study profile	general academic profile
Field of study	Chemical and Process Engineering
Specialisation	Green Technologies in Chemical Engineering
Organizational unit	The Faculty of Chemical and Process Engineering
Implementing unit	The Faculty of Chemical and Process Engineering
Course unit	n/a
Course groups	-
Course status	Obligatory
Language of the course	English
Study stage code	ICZTC-S2-MSA-1070
Number of ECTS credits	2

Part I

01. Learning outcomes and the method of conducting classes	
Learning outcomes	see table "Learning outcomes"
Forms of classes and the number of hours in the semester	
lectures	20.00 h
laboratory	10.00 h

02. ECTS balance		
Number of ECTS credits	2	
Course workload	**Hours**	**ECTS**
Total number of hours and ECTS credits for the course:		
Hours and ECTS credits for courses involving direct participation of academic teachers	35	1.40
Hours and ECTS credits involving student's independent work	20	0.80
Total	55	2.20 (2.00)
Number of hours involving direct participation of academic teachers:		
Hours connected with class participation	30	
Other synchronous hours	5	
Total	35	
Number of hours involving student's independent work:		
Hours for student's independent work	20	

03. Course content	
laboratory	1. Synthesis of advanced nanomaterials for catalytic applications. 2. Analysis of electrocatalytic and physicochemical properties of the obtained materials.

Part I

lectures	1. Introduction - general information on the basics of chemical engineering, materials engineering, nanotechnology. 2. Advanced materials in environmentally friendly applications - classification, properties, possibilities of use. 3. The use of chemical engineering in the field of advanced materials – synthesis, possibilities of controlling and modeling the properties of the obtained materials. 4. Verification methods of the properties of the obtained nanomaterials - basic analytical techniques and ways of interpreting the obtained results used to assess the quality of the obtained materials. 5. Directions of development of advanced materials and the role of chemical engineering.

Table: Learning outcomes	
Knowledge	
Outcomes code	P_W09
Description	Student possesses an understanding of the directions of development of industrial technologies and the latest achievements in chemical and process engineering.
Related field-of-study learning outcomes	K2_W09
Skills	
Outcomes code	P_U01
Description	Student demonstrates the ability to acquire information from various sources such as literature, databases, and foreign language materials in the field of chemical and process engineering. Additionally, the student is able to integrate the obtained information, interpret and critically evaluate it, as well as draw conclusions and formulate and justify opinions.
Related field-of-study learning outcomes	K2_U01
Outcomes code	P_U18
Description	The student can formulate and verify hypotheses related to engineering issues and simple research problems.
Related field-of-study learning outcomes	K2_U18

Part II

04. Year and semester of studies	
Year	2026Z
Semester	2

05. Course leader and course teachers	
lectures	Marta Mazurkiewicz-Pawlicka
lectures	Marta Mazurkiewicz-Pawlicka
laboratory	Marta Mazurkiewicz-Pawlicka

06. Course objective	
Course objective	The objective of the lecture is to acquaint students with the potential utilization of modern techniques known from chemical and process engineering in the design of materials for advanced applications. The objective of the laboratory is to familiarize students with the fabrication of advanced materials by employing the knowledge acquired from the lecture, as well as methods of their analysis and interpretation of the obtained results.

07. Teaching methods and techniques	
laboratory	The use of modern equipment (such as thermogravimetric analyzer, FT-IR spectrometer, etc.) during laboratory will be used to produce and analyze the materials for catalytic applications.

Part II

lectures	Utilization of digital resources, including presentations, videos, and similar materials, will be incorporated. Additionally, there will be interactive discussions with students about the topics covered in the lecture.

08. Methods of verifying learning outcomes	
Knowledge	
Outcomes code	P_W09
Description	Student possesses an understanding of the directions of development of industrial technologies and the latest achievements in chemical and process engineering.
Verification methods	lectures: written test laboratory: written test
Skills	
Outcomes code	P_U01
Description	Student demonstrates the ability to acquire information from various sources such as literature, databases, and foreign language materials in the field of chemical and process engineering. Additionally, the student is able to integrate the obtained information, interpret and critically evaluate it, as well as draw conclusions and formulate and justify opinions.
Verification methods	laboratory: assessment of active class participation
Outcomes code	P_U18
Description	The student can formulate and verify hypotheses related to engineering issues and simple research problems.
Verification methods	laboratory: assessment of active class participation

09. Required and recommended reading list	
Required reading	1. „NANOCATALYSIS Synthesis and Applications”, Wiley-VCH 2013, edited by V. Polshettiwar and T. Asefa. 2. „Materials Science and Engineering of Carbon: Characterization”, Elsevier, 2016, edited by M. Inagaki and F. Kang. 3. „Nanomaterials in Catalysis”, Wiley-VCH 2013, edited by P. Serp and K. Philippot. 4. “Low-cost Nanomaterials: Toward Greener and More Efficient Energy Applications”, Springer, 2014, edited by Z. Lin and J. Wang. 5. Current literature available in scientific journals indicated by the lecturer.

10. Other information	
Other information	-