



# Curriculum

**Field of study:** Modern Materials Design and Application

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## General characteristics of the field of study

### Basic information

Faculty name:	Faculty of Non-Ferrous Metals
Field of study:	Modern Materials Design and Application
Level:	Second-cycle (engineer) programme
Profile:	General academic
Form:	Full-time studies
ISCED classification:	0715
Number of ECTS credits necessary to complete studies at a given level:	90
Professional title awarded to graduates:	magister inżynier
Cycle start date:	2024/2025, summer semester
Duration of studies (number of semesters):	3

### Field of science to which the field of study is assigned:

Field engineering and technical sciences

### Discipline of science to which the field of study is assigned:

Discipline	Percentage	ECTS
Material Engineering	100%	90

### Relationship between the field of study and the AGH University development strategy and the AGH University mission

Studies at the Faculty of Non-Ferrous Metals fulfill the development strategy and mission of the AGH University of Science and Technology in terms of extending students' skills in acquiring and utilizing knowledge, developing their logical, constructive, and forward-looking thinking, and also building an accurate reasoning with an optimal decision-making process. The priority of the strategy of the Faculty of Non-Ferrous Metals of the AGH UST in the field of Modern Materials Design and Application programme is the high quality of the education process and the best position of the faculty graduates on the labor market. Education is carried out in accordance with the mission and strategy delivered in the University's Statute.

### Information on taking into account the socio-economic demand while creating the curriculum and indication of the assumed learning outcomes matching the identified demand

Modern Materials Design and Application studies programme guarantees the socio-economic demands through implementation to study programme key subjects for materials science and engineering of non-ferrous metals. Strategic subjects target development of advanced materials through designing process, application of modern synthesis and processing techniques including conventional or powder metallurgy, plastic working, heat treatment, and other advanced technologies featured for modern materials science. Social sciences, humanities, and economic courses are also included in the education program allowing for gaining socio-economic competencies necessary in engineering community and global market.

**Education paths - scope in Polish and in English**

None

**Graduation paths - scope in Polish and in English**

None

**The names of the majors in Polish and in English**

**Name [pl]**

**Name [en]**

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## **General information about the curriculum**

Field of study: Modern Materials Design and Application

### **General information related to the curriculum (general learning objectives and employment opportunities, typical jobs and opportunities for graduate continuing education)**

Modern Materials Design and Application (MMDA) master's degree program is an educational offer dedicated to graduate students with general background in materials science including materials physics, chemistry, and engineering. The coursework program of MMDA allows students to grow adept in the knowledge and skills of advanced materials and processing technologies. The programme encompasses lecture, seminar, project, and laboratory classes focused on the designing processes and materials, application of modern synthesis and processing techniques including plastic working, heat treatment, powder metallurgy and other advanced technologies featured for modern materials science. Courses and activities are aimed into better understanding structure-property-performance-application relationship and to give students an expertise in evaluating, designing, improving and fabrication of unique materials based on non-ferrous metals and alloys. Curriculum of MMDA introduces also courses allowing students to develop communication and presentation skills, entrepreneurial initiatives, teamwork, and leadership skills as well as socio-economic competencies.

Modern Materials Design and Application education programme aims at promoting highly qualified engineers dedicated for employment in non-ferrous metals industry particularly with major in materials science including advanced powder metallurgy techniques, advanced and non-conventional metal working and heat treatment processes as well as modern techniques for surface treatments. Graduates are well prepared for professional work in domestic and international industrial plants leading in designing and processing of non-ferrous metals, laboratories and research institutes, R&D departments, and academia. The graduates may continue education at the third-cycle degree studies with major in materials science and mechanical engineering.

### **Information on including the conclusions from the students and graduates careers monitoring in the curriculum**

According to data received from AGH Career Center, graduates of the Faculty of Non-Ferrous Metals do not report any problems with employment in the industry and other related units requiring advanced expertise provided by the education programme of Modern Materials Design and Application. Statistical data show high employment rate of recent graduates of Faculty of Non-Ferrous Metals wherein 90% of graduates find a position immediately after graduation. Future labor market for alumni is ensured within national industrial plants and international companies related to non-ferrous metals.

### **Information on including the requirements and recommendations of the accreditation committees, in particular the Polish Accreditation Committee and industry accreditation committees in the curriculum**

In recent years, at the Faculty of Non-Ferrous Metals, all fields of study have been accredited - institutional accreditation. The faculty received a high evaluation of its teaching activity. The Polish Accreditation Committee recommendations for procedure improvements have been implemented. By decision of October 16, 2017, No. 16 / KAT / 2017, the Faculty of Non-Ferrous Metals was classified by "A" scientific category.

### **Information on including examples of good practice in the curriculum**

The priority of the strategy of the Faculty of Non-Ferrous Metals in the area of education is the high quality of the education process and the best position of the Faculty graduates on the labor market. Education is carried out in accordance with the mission and strategy set out in the University's Statute and is also in line with the latest world trends. Faculty employees systematically participate in conferences and seminars, as well as various dedicated courses, increasing their competencies. They update the content of the modules on an ongoing basis and implement modern teaching tools. The program is designed to ensure high course electivity within the modules. In addition, the faculty cooperates extensively with international and national research units, as well as with industry, which has a direct impact on the study programs. Regular

student meetings in the form of seminars and lecture with representatives of the non-ferrous metals industry are organized. Industry specialists have also participated in the conduct of selected specialized modules for many years. A very good example of good practice is also the participation of students in the Erasmus + program, as well as the possibility of carrying out internships and diploma theses with industrial partners, as well as the work of the students as part of student research group and projects implemented by employees of the Faculty of Non-Ferrous Metals. In addition, students can participate in additional classes (courses, training, study trips, internships) organized as part of the Integrated Development Program of the AGH University of Science and Technology in Krakow II (ZRP AGH II), co-financed by the Knowledge Education Development Operational Program 2014-2020, Axis III Higher education for the economy and development, Operation 3.5 Comprehensive universities programs (implementation period: 01/10/2019 - 30/09/2023).

### **Information on cooperation in the preparation of the curriculum with external stakeholders, in particular associations, professional and social organizations**

As part of the work on improving the education offer of the Faculty in terms of its compatibility with the current expectations of the national and global market of the non-ferrous metals industry, as well as improving the quality of education of students at the Faculty of Non-Ferrous Metals, a number of planned activities have been implemented over the last few years. All the activities aimed to develop a new teaching system under the general name of Industry - Science - Industry - Graduate profile - Educational offer of Faculty of Non-Ferrous Metals. The Faculty of Non-Ferrous Metals actively participated in conferences and seminars organized by industry associations (SITMN - Association of Engineers and Technicians of Non-Ferrous Metals - SITMN) and business environment institutions for the non-ferrous metals industry (Economic Chamber of Non-Ferrous Metals and Recycling- IGMNiR). Conferences and seminars were mostly focused on: (i) the analysis of the professional competence of the Non-Ferrous Metals Faculty graduate, (ii) description of the current needs of the non-ferrous metals industry in terms of skills and competencies of future employees and (iii) the development of concept of continuous cooperation between scientific (including AGH-WMN) and industrial units in terms of education programme for the future engineers and employees of non-ferrous metals industrial units. Works on the upgrade of the education system includes: (i) comprehensive analysis of the requirements of the Polish and global labor market in the non-ferrous metals industry and other related units, (ii) a series of discussion panels with industry and academia representatives in terms of the required competencies of the current and future graduates, (iii) a series of discussion panels with students concerning classes, its conduction form and effective teaching techniques and strategies, (iv) a series of discussions with the academic teachers on the current education programmes, courses, modules, syllabuses, and students working load, (v) analysis of the student's satisfaction surveys, (vi) selection of leaders within individual subjects and modules.

### **Duration, rules and form of the practical placement**

Not applicable

## **Admission criteria, rules and policies**

Field of study: Modern Materials Design and Application

### **Description of competences expected from the candidate applying for admission to studies**

The candidate applying for admission to the second-cycle studies shall have completed the first-cycle (Bachelor) degree study. At least the B-2 level English proficiency is required to be documented by English certificate or diploma supplement. The English proficiency requirement might also be verified during candidate interview. Graduates of the first-cycle studies with major in materials science and candidates with an interest in new and advanced materials and technologies are preferred as applicants.

### **Recruitment conditions, including the winners and finalists of the central level high school scientific Olympics, as well as winners of international and national contests**

The admission to studies at Modern Materials Design and Application are compiled under the terms of the AGH University of Science and Technology Study Regulations specified for second-cycle degree studies (Resolution of the AGH UST Senate No. 67/2021 of June 30, 2021). Admission shall include submission of the declaration of qualification for studies through on-line recruitment system and participation in entrance examination confirming the achievement of selected directional learning outcomes. Only candidates with the engineer's degree are allowed to apply.

### **The expected limit of admissions to studies along with an indication of the minimum number of admitted candidates required to successfully launch a study cycle**

The expected admission limit of 20 people. The minimum number of people admitted: 8 people.

## Learning outcomes

Field of study : Modern Materials Design and Application

### Knowledge

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
<b>MMDA2A_W01</b>	Student has an extensive and well-established knowledge in the field of materials science of non-ferrous metals essential to understanding the processes relevant to materials engineering, in particular processing and metallography of non-ferrous metals	P7S_WG_A
<b>MMDA2A_W02</b>	Student has extended knowledge in the field of manufacturing techniques of semi-and final products, multicomponent non-ferrous metals composites developed by various synthesis and metal working processes	P7S_WG_A
<b>MMDA2A_W03</b>	Student has extended knowledge in designing and manufacturing of smart and modern materials for use in strategic sectors of the economy	P7S_WG_A_Inz, P7S_WG_A
<b>MMDA2A_W04</b>	Student knows and understands advanced measurement and research techniques for characterization of materials and products	P7S_WG_A
<b>MMDA2A_W05</b>	Student knows and understands advanced technological processes including the operational life cycle of machines, devices, facilities, technical systems as well materials in particular non-ferrous metals produced by non-conventional processes and advanced metal working techniques	P7S_WG_A_Inz, P7S_WG_A
<b>MMDA2A_W06</b>	Student knows and follows the occupational safety and health basic rules during conducting laboratory experiments	P7S_WG_A
<b>MMDA2A_W07</b>	Student knows and understands physical, mathematical, statistical and IT principles necessary for the interpretation, processing, and evaluation of measured data	P7S_WG_A
<b>MMDA2A_W08</b>	Student knows and understands the fundamental dilemmas of modern civilization; economic, legal, ethical, and other conditions for various types of professional activity related to the field of study Modern Materials Design and Application	P7S_WK_A_Inz, P7S_WK_A

### Skills

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
<b>MMDA2A_U01</b>	Student is able to utilize acquired knowledge to solve advanced engineering problems, including the selection of materials for various applications and innovative processes that enable obtaining modern materials with defined properties and other operating parameters, also for non-standard applications	P7S_UW_A, P7S_UW_A_Inz_0 1
<b>MMDA2A_U02</b>	Student is able to utilize acquired knowledge to solve economic problems in the industry of non-ferrous metals by using structural, functional, noble and composite materials based on non-ferrous metals and alloys	P7S_UW_A_Inz_0 2, P7S_UW_A
<b>MMDA2A_U03</b>	Student has an ability to work in national and international research teams, prove at least B2+ level English proficiency as defined by Common European Framework of Reference for Languages, and shows an ability to use technical English	P7S_UK_A
<b>MMDA2A_U04</b>	Student is able to exploit specialized sources of scientific information, has the ability to use the acquired knowledge and information, including advanced information and communication techniques to solve complex material problems in strategic sectors of the economy using non-ferrous metals	P7S_UW_A
<b>MMDA2A_U05</b>	Student has an ability to organize individual and teamwork plan and is able to cooperate within national and international teams, and shows ability for management functions requiring raising professional qualifications of team members	P7S_UO_A

<b>KEU symbol</b>	<b>Learning outcomes prescribed to a field of study</b>	<b>CEU symbol</b>
<b>MMDA2A_U06</b>	Student has an ability to independently plan, implement and improve their own qualifications and competencies	P7S_UU_A

## **Social competence**

<b>KEU symbol</b>	<b>Learning outcomes prescribed to a field of study</b>	<b>CEU symbol</b>
<b>MMDA2A_K01</b>	Student is ready to make a critical self-assessment of the acquired knowledge, can assess the value of gathered information in solving cognitive and practical problems and consult experts in matters requiring professional advice	P7S_KK_A
<b>MMDA2A_K02</b>	Student is ready to think and act in an enterprising and creative manner, initiate activities for the benefit of the economy and the social environment, and demonstrate care for the natural environment	P7S_KO_A
<b>MMDA2A_K03</b>	Student is ready to follow the rules of professional conducts, support and share the traditions of the AGH University of Science and Technology and the Faculty of Non-Ferrous Metals in Poland and around the world	P7S_KR_A

# Compliance table of engineering competence (Inz) with directional learning outcomes (KEU)

Major : Modern Materials Design and Application

## Knowledge

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_WG_A_Inz	knowledge of basic processes taking place in the life cycle of technical devices, facilities and systems	MMDA2A_W03, MMDA2A_W05
P7S_WK_A_Inz	knowledge of basic principles of creating and developing various forms of individual entrepreneurship	MMDA2A_W08

## Skills

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_UW_A_Inz_01	ability to plan and carry out experiments, including measurements and computer simulations as well as to interpret the obtained results and draw conclusions out of them. When identifying and formulating the specification of engineering problems and solving them, being able to: - use analytical, simulation and experimental methods; - recognize their systemic and non-technical aspects, including ethical connotations; - conduct a preliminary economic assessment of the proposed solutions and planned engineering activities; - perform a critical analysis of the functioning of existing technical solutions to further evaluate them;	MMDA2A_U01
P7S_UW_A_Inz_02	ability to design solutions in compliance with the given specification as well as being able to: create simple devices, facilities and systems typical for the study major or implement processes using skillfully chosen methods, techniques, tools and materials	MMDA2A_U02

## Field of study-prescribed outcomes coverage matrix

Field of study: Modern Materials Design and Application

2024/2025/S/III/MN/MMDA/all

Course	Code	Semestr	MMDA2A_W01	MMDA2A_W02	MMDA2A_W03	MMDA2A_W04	MMDA2A_W05	MMDA2A_W06	MMDA2A_W07	MMDA2A_W08	MMDA2A_U01	MMDA2A_U02	MMDA2A_U03	MMDA2A_U04	MMDA2A_U05	MMDA2A_U06	MMDA2A_K01	MMDA2A_K02	MMDA2A_K03
Chemistry for materials science	NMMDAS.IIi1K.8834febb9ffca41c7c52f8795803d3a5.24	1s	x		x	x	x				x		x		x		x		
Physicochemistry of nano-structural surface layers	NMMDAS.IIi1K.23885279179e05a3f61efc64f5ee877f.24	1s	x	x	x	x	x	x	x	x				x	x	x			
Innovative sintered materials and composites	NMMDAS.IIi1K.50d28239d0b85a8354b14437d2987708.24	1s	x	x	x	x	x	x			x		x	x	x			x	x
Texture development in metals	NMMDAS.IIi1K.f2d289a003dfd6782f842be1a3a04cb3.24	1s	x			x		x	x		x		x	x	x	x			
Automation of experiments and analysis of results in materials science	NMMDAS.IIi1K.1de777f67582e2c53e44423b2f0a1c64.24	1s				x			x		x					x			
Product Quality Management	NMMDAS.IIi1K.81aa967d54b8cb437b9d188e70f9ace5.24	1s					x			x		x		x	x	x	x	x	x
Advances in non-ferrous metals science	NMMDAS.IIi1K.620a055dc136a.24	1s	x	x	x	x	x				x	x					x	x	
Fundamentals on non-ferrous metals engineering	NMMDAS.IIi1K.5b164bb11d43d515e1d2917df3ad7f4f.24	1s	x	x							x						x		
Light metals and alloys	NMMDAS.IIi2K.9ddde05634c903f0a6b881980cd30af6.24	2s	x	x	x	x					x	x		x					
Welding and joining processes	NMMDAS.IIi2K.9a217de0c7c95f4f45c98bfd005f267b.24	2s				x	x								x	x			
Technical Foreign Language B2+	NMMDAS.IIi2J0.620a056582682.24	2s											x						

Course	Code	Semestr	MMDA2A_W01	MMDA2A_W02	MMDA2A_W03	MMDA2A_W04	MMDA2A_W05	MMDA2A_W06	MMDA2A_W07	MMDA2A_W08	MMDA2A_U01	MMDA2A_U02	MMDA2A_U03	MMDA2A_U04	MMDA2A_U05	MMDA2A_U06	MMDA2A_K01	MMDA2A_K02	MMDA2A_K03
Materials and technologies in the automotive and aviation industry	NMMDAS.IIi2K.620a0563c5e12.24	2s	x	x	x		x				x	x		x	x	x	x	x	x
Technologies in the cable industry	NMMDAS.IIi2K.620a05645fda3.24	2s		x	x	x	x			x			x	x	x	x	x	x	x
Materials for medical applications	NMMDAS.IIi2K.1dd9bfa0a93fef6de7115f8eb3ed2ab7.24	2s	x		x					x	x	x					x		
High pressures in material technologies	NMMDAS.IIi2K.620f851330a73.24	2s	x		x	x					x		x		x		x		
Modern methods for the separation and purification of metals	NMMDAS.IIi2K.620a05627893f.24	2s		x	x				x		x	x		x			x	x	
Modern processing of non-ferrous metals	NMMDAS.IIi2K.ce2862e82f2837233124e053527ffbda.24	2s	x	x	x	x	x				x	x	x	x	x		x	x	x
Modern techniques for metal analysis	NMMDAS.IIi2K.1012e5ec9d928974d2417ac8fb882c29.24	2s	x			x		x	x		x		x	x	x	x			
Nanomaterials	NMMDAS.IIi4K.d57ba9a242ee4351ff630ce351e5124c.24	3s	x		x	x	x				x								
Diploma Thesis	NMMDAS.IIi4K.e53bc1ffec52171870fc55d1cec2fa6a.24	3s	x		x	x				x	x	x		x			x	x	
Modern surface engineering	NMMDAS.IIi4K.4b8a9c618a33055964780a29bcbcae3a.24	3s	x	x	x		x		x		x	x				x	x	x	
Modeling of structure and strength evolution during plastic deformation of metals	NMMDAS.IIi4K.1afbb7c10b53464ea81b5ea6fad179ff.24	3s	x	x	x	x	x		x		x	x		x	x	x	x	x	x
Materials inspired by nature	NMMDAS.IIi4K.5f96abfdf266c.24	3s	x	x	x	x					x		x	x	x	x	x	x	
Diploma Seminar	NMMDAS.IIi4K.113e607328fe3b1feac36d5c37a13bcd.24	3s	x	x	x	x				x			x	x	x	x	x	x	
Micromechanics of composite materials	NMMDAS.IIi4K.5f96a3db385ed.24	3s	x	x	x				x		x	x		x		x	x	x	
Sum (obligatory):			9	7	8	8	4	2	2	3	9	6	5	8	6	3	8	7	3

Course	Code	Semestr	MMDA2A_W01	MMDA2A_W02	MMDA2A_W03	MMDA2A_W04	MMDA2A_W05	MMDA2A_W06	MMDA2A_W07	MMDA2A_W08	MMDA2A_U01	MMDA2A_U02	MMDA2A_U03	MMDA2A_U04	MMDA2A_U05	MMDA2A_U06	MMDA2A_K01	MMDA2A_K02	MMDA2A_K03
		Sum (elective):		10	7	10	9	8	2	6	3	10	5	4	8	7	11	7	7
Sum:		19	14	18	17	12	4	8	6	19	11	9	16	13	14	15	14	6	

## Characteristics matrix of learning outcomes in relation to modules

Major: Modern Materials Design and Application

2024/2025/S/III/MN/MMDA/all

Course	Code	Semestr	P7S_WG_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_WK_A	P7S_UW_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_UK_A	P7S_UO_A	P7S_UU_A	P7S_KK_A	P7S_KO_A	P7S_KR_A
			x	x		x	x								
Chemistry for materials science	NMMDAS.IIi1K.8834febb9ffc41c7c52f8795803d3a5.24	1s	x	x			x	x				x		x	
Physicochemistry of nano-structural surface layers	NMMDAS.IIi1K.23885279179e05a3f61efc64f5ee877f.24	1s	x	x	x	x	x				x	x			
Innovative sintered materials and composites	NMMDAS.IIi1K.50d28239d0b85a8354b14437d2987708.24	1s	x	x			x	x		x	x			x	x
Texture development in metals	NMMDAS.IIi1K.f2d289a003dfd6782f842be1a3a04cb3.24	1s	x				x	x		x	x	x			
Automation of experiments and analysis of results in materials science	NMMDAS.IIi1K.1de777f67582e2c53e44423b2f0a1c64.24	1s	x				x	x				x			
Product Quality Management	NMMDAS.IIi1K.81aa967d54b8cb437b9d188e70f9ace5.24	1s	x	x	x	x	x		x		x	x	x	x	x
Advances in non-ferrous metals science	NMMDAS.IIi1K.620a055dc136a.24	1s	x	x			x	x	x				x	x	
Fundamentals on non-ferrous metals engineering	NMMDAS.IIi1K.5b164bb11d43d515e1d2917df3ad7f4f.24	1s	x				x	x					x		
Light metals and alloys	NMMDAS.IIi2K.9ddde05634c903f0a6b881980cd30af6.24	2s	x	x			x	x	x						
Welding and joining processes	NMMDAS.IIi2K.9a217de0c7c95f4f45c98bfd005f267b.24	2s	x	x							x	x			
Technical Foreign Language B2+	NMMDAS.IIi2JO.620a056582682.24	2s								x					
Materials and technologies in the automotive and aviation industry	NMMDAS.IIi2K.620a0563c5e12.24	2s	x	x			x	x	x		x	x	x	x	x
Technologies in the cable industry	NMMDAS.IIi2K.620a05645fda3.24	2s	x	x	x	x	x			x	x	x	x	x	x

Course	Code	Semestr	P7S_WG_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_WK_A	P7S_UW_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_UK_A	P7S_UO_A	P7S_UU_A	P7S_KK_A	P7S_KO_A	P7S_KR_A
			x	x	x	x	x	x	x	x	x	x	x	x	x
Materials for medical applications	NMMDAS.IIi2K.1dd9bfa0a93fef6de7115f8eb3ed2ab7.24	2s	x	x	x	x	x	x	x					x	
High pressures in material technologies	NMMDAS.IIi2K.620f851330a73.24	2s	x	x			x	x		x	x			x	
Modern methods for the separation and purification of metals	NMMDAS.IIi2K.620a05627893f.24	2s	x	x			x	x	x					x	x
Modern processing of non-ferrous metals	NMMDAS.IIi2K.ce2862e82f2837233124e053527ffbda.24	2s	x	x			x	x	x	x	x			x	x
Modern techniques for metal analysis	NMMDAS.IIi2K.1012e5ec9d928974d2417ac8fb882c29.24	2s	x				x	x		x	x	x			
Nanomaterials	NMMDAS.IIi4K.d57ba9a242ee4351ff630ce351e5124c.24	3s	x	x			x	x							
Diploma Thesis	NMMDAS.IIi4K.e53bc1ffec52171870fc55d1cec2fa6a.24	3s	x	x	x	x	x	x						x	x
Modern surface engineering	NMMDAS.IIi4K.4b8a9c618a33055964780a29bcbcae3a.24	3s	x	x			x	x	x			x	x	x	
Modeling of structure and strength evolution during plastic deformation of metals	NMMDAS.IIi4K.1afbb7c10b53464ea81b5ea6fad179ff.24	3s	x	x			x	x	x		x	x	x	x	x
Materials inspired by nature	NMMDAS.IIi4K.5f96abfdf266c.24	3s	x	x			x	x		x	x	x	x	x	
Diploma Seminar	NMMDAS.IIi4K.113e607328fe3b1feac36d5c37a13bcd.24	3s	x	x	x	x	x			x	x	x	x	x	
Micromechanics of composite materials	NMMDAS.IIi4K.5f96a3db385ed.24	3s	x	x			x	x	x			x	x	x	
Sum (obligatory):			11	9	3	3	11	9	6	5	6	3	8	7	3
Sum (elective):			13	11	3	3	12	10	5	4	7	11	7	7	3
Sum:			24	20	6	6	23	19	11	9	13	14	15	14	6

## Matrix of learning outcomes prescribed to a field of study with related forms of classes and the method of testing

Major: Modern Materials Design and Application

2024/2025/S/III/MN/MMDA/all

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Chemistry for materials science	Lectures, Project classes	Test results, Activity during classes, Participation in a discussion, Execution of a project, Involvement in teamwork, Presentation	MMDA2A_W01, MMDA2A_W03, MMDA2A_W04, MMDA2A_W05, MMDA2A_U04, MMDA2A_U01, MMDA2A_U06, MMDA2A_K02
Physicochemistry of nano-structural surface layers	Lectures, Project classes	Test, Presentation, Oral answer, Project, Presentation	MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W06, MMDA2A_W07, MMDA2A_W08, MMDA2A_W04, MMDA2A_W05, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06
Innovative sintered materials and composites	Lectures, Laboratory classes, Seminars	Activity during classes, Examination, Test, Report, Oral answer, Participation in a discussion, Presentation	MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W04, MMDA2A_W06, MMDA2A_W05, MMDA2A_U01, MMDA2A_U03, MMDA2A_U04, MMDA2A_U05, MMDA2A_K02, MMDA2A_K03
Texture development in metals	Lectures, Laboratory classes	Test, Execution of laboratory classes, Report, Completion of laboratory classes	MMDA2A_W01, MMDA2A_W04, MMDA2A_W06, MMDA2A_W07, MMDA2A_U01, MMDA2A_U03, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06
Automation of experiments and analysis of results in materials science	Lectures, Project classes	Participation in a discussion, Test, Project, Involvement in teamwork, Test results, Activity during classes, Test, Project, Scientific paper, Involvement in teamwork, Test results, Presentation	MMDA2A_W04, MMDA2A_W07, MMDA2A_U01, MMDA2A_U06
Product Quality Management	Lectures, Project classes	Activity during classes, Participation in a discussion, Examination, Activity during classes, Execution of a project, Involvement in teamwork	MMDA2A_W05, MMDA2A_W08, MMDA2A_U02, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02, MMDA2A_K03
Advances in non-ferrous metals science	Lectures, Seminars, Discussion seminars	Examination, Participation in a discussion, Presentation, Project, Involvement in teamwork	MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W04, MMDA2A_W05, MMDA2A_U01, MMDA2A_U02, MMDA2A_K01, MMDA2A_K02

<b>Name of the module</b>	<b>Activity</b>	<b>Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module</b>	<b>KEU references</b>
Fundamentals on non-ferrous metals engineering	Lectures, Laboratory classes, Project classes	Examination, Execution of laboratory classes, Test, Report, Involvement in teamwork, Participation in a discussion, Scientific paper, Presentation	MMDA2A_W01, MMDA2A_W02, MMDA2A_U01, MMDA2A_K01
Light metals and alloys	Lectures, Laboratory classes, Seminars	Activity during classes, Participation in a discussion, Examination, Activity during classes, Participation in a discussion, Execution of laboratory classes, Report, Completion of laboratory classes, Activity during classes, Project, Presentation	MMDA2A_W01, MMDA2A_W04, MMDA2A_W02, MMDA2A_W03, MMDA2A_U01, MMDA2A_U02, MMDA2A_U04
Welding and joining processes	Lectures, Laboratory classes, Project classes	Test, Test, Scientific paper, Essay	MMDA2A_W04, MMDA2A_W05, MMDA2A_U05, MMDA2A_U06
Technical Foreign Language B2+	Foreign language classes	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Report, Scientific paper, Test results, Essays written during classes, Presentation	MMDA2A_U03
Materials and technologies in the automotive and aviation industry	Lectures, Project classes, Discussion seminars	Participation in a discussion, Test, Execution of a project, Participation in a discussion, Essay	MMDA2A_W01, MMDA2A_W03, MMDA2A_W02, MMDA2A_W05, MMDA2A_U01, MMDA2A_U02, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02, MMDA2A_K03
Technologies in the cable industry	Lectures, Project classes	Test results, Execution of a project	MMDA2A_W02, MMDA2A_W04, MMDA2A_W08, MMDA2A_W03, MMDA2A_W05, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06, MMDA2A_U03, MMDA2A_K01, MMDA2A_K02, MMDA2A_K03
Materials for medical applications	Lectures, Seminars, Discussion seminars	Participation in a discussion, Test, Scientific paper, Presentation, Participation in a discussion, Essay	MMDA2A_W01, MMDA2A_W03, MMDA2A_W08, MMDA2A_U01, MMDA2A_U02, MMDA2A_K01
High pressures in material technologies	Lectures, Seminars	Test, Examination, Participation in a discussion, Project, Report, Presentation	MMDA2A_W01, MMDA2A_W03, MMDA2A_W04, MMDA2A_U01, MMDA2A_U03, MMDA2A_U05, MMDA2A_K01
Modern methods for the separation and purification of metals	Lectures, Project classes, Laboratory classes	Examination, Execution of a project, Execution of laboratory classes, Test	MMDA2A_W02, MMDA2A_W03, MMDA2A_W07, MMDA2A_U01, MMDA2A_U02, MMDA2A_U04, MMDA2A_K01, MMDA2A_K02

<b>Name of the module</b>	<b>Activity</b>	<b>Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module</b>	<b>KEU references</b>
Modern processing of non-ferrous metals	Lectures, Laboratory classes, Project classes	Examination, Test, Project	MMDA2A_W01, MMDA2A_W04, MMDA2A_W05, MMDA2A_W02, MMDA2A_W03, MMDA2A_U01, MMDA2A_U02, MMDA2A_U03, MMDA2A_U04, MMDA2A_U05, MMDA2A_K02, MMDA2A_K03, MMDA2A_K01
Modern techniques for metal analysis	Lectures, Laboratory classes, Project classes	Test, Activity during classes, Completion of laboratory classes, Activity during classes	MMDA2A_W01, MMDA2A_W04, MMDA2A_W06, MMDA2A_W07, MMDA2A_U01, MMDA2A_U03, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06
Nanomaterials	Lectures, Seminars, Discussion seminars	Participation in a discussion, Test, Scientific paper, Presentation, Participation in a discussion, Essay	MMDA2A_W01, MMDA2A_W03, MMDA2A_W05, MMDA2A_W04, MMDA2A_U01
Diploma Thesis	Diploma Thesis	Diploma thesis, Diploma thesis preparation	MMDA2A_W01, MMDA2A_W03, MMDA2A_W08, MMDA2A_W04, MMDA2A_U02, MMDA2A_U04, MMDA2A_U01, MMDA2A_K01, MMDA2A_K02
Modern surface engineering	Lectures, Laboratory classes, Project classes	Activity during classes, Execution of laboratory classes, Test, Report, Completion of laboratory classes, Participation in a discussion, Project, Presentation	MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W05, MMDA2A_W07, MMDA2A_U01, MMDA2A_U02, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02
Modeling of structure and strength evolution during plastic deformation of metals	Lectures, Laboratory classes, Project classes	Test, Test, Execution of a project	MMDA2A_W01, MMDA2A_W04, MMDA2A_W07, MMDA2A_W02, MMDA2A_W03, MMDA2A_W05, MMDA2A_U01, MMDA2A_U02, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02, MMDA2A_K03
Materials inspired by nature	Lectures, Project classes, Discussion seminars	Test results, Activity during classes, Participation in a discussion, Execution of a project, Involvement in teamwork, Presentation, Activity during classes, Case study, Involvement in teamwork	MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W04, MMDA2A_U01, MMDA2A_U03, MMDA2A_U04, MMDA2A_U05, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02
Diploma Seminar	Seminars	Presentation	MMDA2A_W08, MMDA2A_W01, MMDA2A_W02, MMDA2A_W03, MMDA2A_W04, MMDA2A_U03, MMDA2A_U05, MMDA2A_U06, MMDA2A_U04, MMDA2A_K01, MMDA2A_K02
Micromechanics of composite materials	Lectures, Seminars, Discussion seminars	Test, Presentation, Execution of a project	MMDA2A_W02, MMDA2A_W01, MMDA2A_W03, MMDA2A_W07, MMDA2A_U01, MMDA2A_U02, MMDA2A_U04, MMDA2A_U06, MMDA2A_K01, MMDA2A_K02

## **Detailed rules of the implementation of the curriculum established by the Dean of the Faculty (the so-called Study Rules)**

Field of study: Modern Materials Design and Application

### **Enrollment rules for the next semester**

Detailed rules for the next semester enrollment are specified in AGH University of Science and Technology Study Regulations.

### **Enrollment rules for the next semester as a part of the so-called ECTS credits debt ceiling**

Detailed rules for the next semester registration are specified in AGH University of Science and Technology Study Regulations. Completion of the semester of studies and confirmation of registration for the next semester of studies shall be take place in the University's computer system no later than one week from the beginning of the next semester. Confirmation of registration for the next semester of studies shall also take place in the student's periodical achievements card. Students may register for the next semester if their total ECTS point deficit does not exceed 10 ECTS. A student shall apply in this matter to the Dean of the Faculty.

### **ECTS credits debt ceiling**

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### **Organization of classes within the so-called blocks of classes (i.e. such organization of subjects or individual forms of classes that creates exceptions to the cyclical nature of classes in particular weeks of a given semester of studies)**

Not applicable

### **Monitoring semesters**

None

### **Study rules in case of the individual organization of studies approved for a specific student**

A student may have an opportunity of studying at University in accordance with an individual study programme (hereafter ISP), with the consent of the Dean. Dean's permission for ISP is primarily given for outstanding students and requires student's average grade above 4.20 and consent of ISP student supervisor. Detailed ISP programme is established by student in agreement with the student supervisor and requires Dean's approval. Student shall be required to file a motion with explanation for granting on individual study programme to the Dean. Studies according to ISP programme cannot change directional learning outcomes and learning modules specified as obligatory for a given field of study, level or profile. Extension of graduation date within ISP programme is not permitted. Individual study programme is specifically dedicated to students who are: (i) exceptionally talented and outstanding in their education, (ii) disable, (iii) in difficult life situation, (iv) taking part in sports competitions at national or international level, (v) wishing to take part of their studies at another university, (vi) studying at more than one field of, (vii) elected to the collegial bodies of the University, (viii) confirmed with the learning outcomes achieved outside the University, (ix) taking polish language course. Individual study programme can be specifically realized through: (i) individual choice of course modules, methods, and forms of education, (ii) modification of examinations forms or classes completion, (iii) modification of the number of ECTS credits required to complete a semester of study, (iv) modification of weekly class timetable by selecting the class group and/or class hours in the manner that enables their realisation of the study programme, with respect to student's possibilities, (v) modification of examination dates or classes completion dates in consultation with the course instructor.

## **Implementation of practical placements including monitoring system and completion rules**

Not applicable

## **Rules of elective modules taking**

The student shall choose modules of classes from a base of elective subjects common to the entire field of study. The study program includes four content-related areas of elective subjects including: (i) functional materials, (ii) production processes and new technologies, (iii) material analysis and (iv) computer techniques. Foreign language and H-S course modules are also available as elective subjects. Depending on the semester, the student chooses subjects from a given block for a specified number of ECTS credits.

## **Rules of education paths, graduation paths, major choice/eligibility**

Not applicable

## **Rules related to the preparation of diploma projects and theses as well as the implementation of the degree granting**

Diploma thesis topics shall be chosen by students not later than 1 year before the scheduled date of graduation. A Failure in meeting these requirements may result in refusal to register for the diploma semester or, respectively, for the semester preceding the diploma semester. Topics of diploma thesis are approved by the Head of the Department where the thesis is carried out. The diploma procedure includes: (i) Completion of master thesis, (ii) Diploma exam, (iii) Awarding the professional title of Master of Science (M.Sc.). Diploma exam is a prerequisite for completing second-cycle studies at the AGH University of Science and Technology and for issuing a graduation diploma. The student shall be required to complete and submit (register) to the Dean's Office one copy of the dissertation in printed version and one copy in an agreed electronic format (.pdf) no later than by the end of September of the last semester of study. In order to register the diploma thesis students shall be required to complete all the courses and practical placements defined in the study programme, including the study plan (the so-called absolutorium) and shall be granted with a positive grade of the diploma thesis from the thesis supervisor and the reviewer. The diploma thesis shall be assessed independently by the thesis supervisor and by the reviewer. In case of discrepancy between the grade of the supervisor and the reviewer, the final grade of the thesis shall be established during the session of the Diploma Examination Commission. If the supervisor of the master's thesis holds a Ph.D., the reviewer shall be appointed among a full Professor or Doctor of Science (DSc). To the diploma examination shall be allowed a student who: (i) Has completed all the courses included in the study programme; (ii) Has registered the diploma thesis; (iii) Has submitted all the documents required by the Dean. The diploma exam is preceded by Diploma Examination Commission appointed separately for each of the field of study by the Dean of the Faculty. A full list of Examination Commission members is available on the Faculty's website.

## **Principles for determining the overall evaluation of graduation (the final grade)**

The final graduation result (FG), entered into the diploma and into the supplement, is established as a weighted average of the following ratings:  $FG = 0.6 \cdot A + 0.2 \cdot T + 0.2 \cdot E$ , where: A is the average grade of the whole degree programme; T is the final grade of the diploma thesis; E is the diploma examination grade (A, T and E grades must be positive). The graduate, who fulfils all the following requirements: who has submitted the diploma thesis and passed the diploma examination in the due time, who has been granted with an average grade from the studies higher than 4,71, and who has very good grades for the diploma thesis and for the diploma examination, may be awarded a distinction by the Examination Commission. Graduates awarded with the distinction shall receive a diploma with distinction.

## **Other requirements related to the implementation of the curriculum resulting from the AGH University Study Regulations or other regulations in force at the University**

None  
Detailed rules of the implementation of the study programme established by the Dean of the Faculty (the so-called Study Rules)

Modern Materials Design and Application (MMDA) master's degree program is an educational offer dedicated to graduate students with general background in materials science including materials physics, chemistry, and engineering. The coursework program of MMDA allows students to grow adept in the knowledge and skills of advanced materials and processing technologies. The programme encompasses lecture, seminar, project, and laboratory classes focused on the designing processes and materials, application of modern synthesis and processing techniques including plastic working, heat treatment, powder metallurgy and other advanced technologies featured for modern materials science. Courses and activities are aimed into better understanding structure-property-performance-application relationship and to give students an expertise in evaluating, designing, improving and fabrication of unique materials based on non-ferrous metals and alloys. Curriculum of MMDA introduces also courses allowing students to develop communication and presentation skills, entrepreneurial initiatives, teamwork, and leadership skills as well as socio-economic competencies.

Mentor of the field of study: dr hab. inż. Anna Kula, prof. AGH

[View full description of the field of study](#)

Study programme determined by Resolution No. 41/2022 of the AGH UST Senate of 30 March 2022